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MOVEMENT AND THOUGHT

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MOVEMENT AND THOUGHT

BY

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To

L. H.

who made this book possible

PREFACE

Movement and thought are often much alike, as in a person who speaks abruptly and walks jerkily, or in one who is placid and deliberate in word and deed. The way in which such people move and think is due to the way in which they use their nerves; that is, to their nerve-technique or style.

Each individual has his or her own style or mode of life: Long study of movement and thought in both children and adults convinces me that this style in any given person is not merely alike but is actually the same in breathing or digesting or moving or making or thinking. Each of us has his own nerve-technique — one technique for all nerve activities.

On this basis we can see each individual as a unity, and need no longer bother about the old-fashioned division of a human being into body and mind, or try to compare a structure with a function.

After brief consideration of life and its form in Part One of this book, Part Two states very simply the nature and needs of the nervous system, and studies growth and movement. Part Three discusses individuals who are ordinary and those who are different, and shows how available facts may best be arranged if the strains of environment are to be adjusted to individual powers.

Attention is drawn to the charts and diagrams in Parts Two and Three, especially to those in Chapter V of *Glands* *and Growth* and of the *Second Growth Crisis* about the age of 16–18 years, and, in Chapter IX, to that of *Growth and Work* and to the two time-tables showing energy expenditure and recovery.

Part Four is more general, and includes chapters on *Self*, *Fear*, *Physical Education*, and *Re-education*. The last two, with the chart in Chapter XIII showing *The Relation of Physical to General Education*, have a special interest.

I am very grateful to The Royal Society, to Messrs. Baillière, Tindall, and Cox, and to Dr. E. R. A. Cooper and the Oxford University Press for permission to modify various charts and diagrams and to incorporate them in my work. More particular acknowledgment has been made under each of the charts concerned.

REGINALD E. ROPER.

CONSTABLE COTTAGE,
HAMPSTEAD.

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"There is pleasure in doing something new, though never so little, without pestering the world with voluminous transcriptions."

JOHN GRAUNT, LONDON, 1662.

INTRODUCTION

Children take their toys to bits, to find out what makes them go. Adults split children into body and mind. Teachers try to train these pieces separately. Doctors concentrate on body and psychologists on mind. Industrial workers specialize on a single process. Politicians divide communities into factions. Statesmen draw lines on maps and frontiers between peoples. The habit of partition marks our age. We have disintegrated the idea of unity and mechanized our thought. We have taken wisdom to pieces, and sit guessing among the ruins.

It is a mistake to think in terms of body and mind. Body is a structure and mind a function: they cannot be contrasted or compared. Body and brain together, or movement and thought—structure with structure and function with function—this may make sense. On this basis we may perhaps see each living organism as a unity. It is at least worth trying: to fail to do so is to court destruction.

I have found it simpler to take mind and body together, and to try to state them in terms of a factor which is common to both, viz. the nervous system. After many years of study and experiment in education and re-education, I have come to base my practice upon principles which may be stated shortly as follows:

> *All human activities ultimately depend on nerves for their completion. These activities, and the nerves concerned with them, may be grouped in four main classes—living, moving, making, and thinking. Each of us has a personal mode or style of using nervous energy, an individual nerve-technique.*

In any given individual this style is the same whatever the activity. An improvement in nerve-technique in any one activity is an improvement in the single technique of the individual which is common to all the groups. A discord which shows itself in any activity implies a failure in the one nerve-technique common to all activities. To perfect this technique in any activity is to perfect the technique of all of them. The individual can best attain a nervous harmony through self-chosen creative effort.

This theory of the single nerve-technique for all the activities of the individual has grown out of a prolonged study of movement. It seems to me to cover the facts and to offer a satisfactory basis for their arrangement and analysis. It also has the great advantage of avoiding the pitfalls which surround the popular idea that human beings can be divided into body and mind. As far as the mortal being is concerned, which dies and is buried, it would appear to include everything. There are, however, grounds for thinking that there is something more. I find there are times when mortal behaviour can best be understood if we suppose the existence of the immortal. I am thus driven to admit the soundness of that belief in life after death which has marked the human race from its earliest stages.

After nine years of teaching " mental " subjects in a preparatory boarding school for boys, during which I took some rather unskilled gymnastics and drill, I began to feel that routine classwork in languages and mathematics and the like offered little that was new. The opportunity of working in the then new Swedish gymnasium at Eton College provided a welcome change of subject. It was not, however, until I studied at the Royal Central Gymnastic Institute and at Dr. Arvedson's Institute at Stockholm that I began to understand the extent of the field of research into which education through movement might lead. During the four years I was at Eton I taught gymnastics only, taking both educational and remedial work—a valuable but very one-sided experience. It was only during my ten years at Bedales School (as Director of Physical Education for boys) that I was able to combine class-gymnastics (in the mornings) and remedial treatments (in the afternoons or evenings) with regular work in a mental subject—at first with a Latin class and later on with a small group of children for whom Latin had proved unsuitable. The chance thus offered for research into individual abilities and powers was invaluable. I can never be sufficiently grateful for the freedom of experiment which the Headmaster, Mr. J. H. Badley, not only allowed but encouraged, and for the understanding co-operation of those other members of the Staff who made alterations in individual time-tables and curricula possible. It is a privilege to work with men and women who are willing to give up some of the time allotted to their own subject so as to assist the experiments of a colleague, even to the extent of accepting as an excuse for a child's missing one of their lessons that it had fallen asleep during a period of extra rest and that I had omitted to wake it.

Energy varies from hour to hour, and weight rises and falls during the day. Each individual has a normal curve of change. These variations are easier to observe in the gymnasium than in the class-room, for the simple reason that movement is visible and thought invisible. Gradually it became clear to me that a child's available capital of nervous energy has very definite limits, and that a time-table suited to an individual early in the term might prove anything but suitable later on. I learned the need of adjusting the load to the available power. In the remedial gymnasium, dealing with those who had some special handicap, I came to realize the connection between bad work or troublesome behaviour and nervous fatigue, and to see how even a conscientious child may overdraw its available capital and sink deeply into debt in almost every subject in the curriculum. I learned the preventive value of extra rest, and began to study quality rather than quantity of nervous output. In athletics and games, quantity is the measure of success, a mile, six feet, ten yards per second, so many goals or runs: gymnastics are concerned with quality, not with " how much " but with " how ".

These and similar things I came to know chiefly through my hands and arms, through the sense of touch. Hands cannot have the accuracy of a machine in registering quantity of nervous energy, but for appreciating quality they are not only unrivalled but irreplaceable. The tone of a muscle and its owner's nerve-technique live in one's hands during massage. Given enough practice, hands will register the quality of a nerve-impulse with reasonable accuracy and will remember it for months. For example, children are inordinately fond of the many kinds of leap-frog which apparatus makes possible. Catching for some form of this movement even only 100 times a week for 40 weeks a year for 10 years I shall have done so 40,000 times: my actual number is probably much nearer 100,000, sufficient at any rate to enable me to establish a technique of my own which is standardized enough to serve as a gauge for the technique of others. My hands and arms, from finger-tips to shoulders, become capable of appreciating the varied gradations of muscular tone (and therefore the quality of nerve-impulse) which range between those in a body flying joyously through the air after a high vault and needing but a touch in passing in order to secure a perfect landing, and the spasmodic and doll-like rigidity of the anxious child travelling through space and uncertain of its immediate future. Somewhere between these two extremes there is a type of muscular-nervous activity which I can only describe as liquid, and which presents the perfection of relaxation.

Variations of innervation (the sending of messages along the nerves) are innumerable, but the sense of touch can be so developed as to recognize their quality. Up or down a finely graded scale of memory one learns to place the nervous twitchings of a child with a " tic ", the automatic contraction of the muscles moving an injured joint as it approaches the threshold of pain, the quivering tremor of a limb which may result from the use of too much or too little energy or from a misdirected nerve-message, the shock which (in either victim or beholder) follows an accident, and some at least of the many symptoms of fear. Ultimately, without need of touch, and either in or out of class, it becomes possible by interpreting the look of a movement to appreciate the discord of nerve-technique which may lie behind the seemingly stolid exterior of a shy or anxious or so-called defective child. With enough practice one may even predict from variations in nerve-technique the onset of a period of instability which may later show itself as what is called a common cold, or inattention, or indiscipline. By comparing " physical " and " mental " variations of individuals in my own classes and in those of others, I began to understand more about the nervous factor which is common to both.

A priceless feature of education through movement is the opportunity it offers of dealing with states of anxiety or fear. These are signs of a nerve-discord: in their earlier stages they are perfectly natural and reasonable results of an uncertainty which at one time or another we all of us experience; in their later and more organized forms they may develop into a protective or preventive barrier which finally becomes a prison wall. They are errors in nerve-technique, which may often be more easily corrected through movement than through thought, by rearranging the muscular-nervous activities which accompany them in another pattern. In this way the original discord may be resolved into a harmony. It is lamentable to think to what an extent fear is still deliberately used as a means of control in schools and in the world at large. Fear is torment: to remove it is to set free an undreamed-of energy.

In my later practice as a consultant in the education and re-education of individuals with special needs I find that the general principles I have stated apply equally well to older persons. With adults, as with children, movement may prove a solvent of old-established repressions, a key for the liberation of energy, or an aid in redesigning patterns of thought and integrating a disintegrated personality. It has its uses in diagnosis as well as in treatment, and as a means of by-passing an initial shyness it is frequently unrivalled.

It all seems very simple to me now, but I have been long in learning. It is in the hope that I may save them time and trouble that I offer these notes to all who care for children.

PART ONE

CHAPTER I

Life and Living

More than 1800 years ago, describing the foolish prayers of men for riches or strength or power, the poet Juvenal exclaimed " Orandum est ut sit mens sana in corpore sano " —" Let us pray that the spirit in a healthy body may be healthy ", that function as well as structure may be sound (*Satire X*, line 356). Because the words contain several useful examples of syntax and prosody they are included in many Latin grammars, and children learn them by heart. Teachers and those who distribute prizes on school speech-days quote them constantly: the men and women responsible for physical education have made them a motto. " Mens sana in corpore sano " has become an English phrase, a popular tag, and the general public takes it for granted that an individual may be divided into two parts, body and mind, and finds it quite difficult to think of a human being in any other terms. We have slipped into the habit of picturing the body as a house for the mind, in which—so long as it is kept clean and bright—we expect the invisible dweller to be happy and efficient. The results of this mistake are disastrous.

It is not even as though we thought of the child as a runner or the child as a scholarship candidate, dividing its activities yet presuming an individuality common to them all—as we might speak of Irving as Macbeth, Irving as King Lear, or Othello, yet always with the thought of one individual behind all the parts. Mind is invisible and body visible; we can see hands and face and limbs, but we do not see brain. Just as we personify body, and see it when we talk of John or Jane, so we have come to personify mind and to think of it as a separate thing, apart from yet inside of body. We divide the individual, and on this twofold basis we try to build not merely a theory of education or re-education but a whole philosophy of life. Naturally it crumbles to pieces in our hands. It is because our crude translation of Juvenal's words, sound mind in sound body, makes such a perfect setting for this error that it is so dangerous.

The mistake in trying to think of a living being in terms of mind and body, though fundamental, is really very simple. When we study a thing we observe how it is made and how it works: if it is alive, we note what it is and what it does. "What it is" we call its nature or structure: "what it does" is its activity or function. When we compare two things we contrast the structure of one with the structure of the other, and function with function. If we were to try to compare the structure of one with the function of the other we should get nowhere, and this is precisely what we do when we try to compare or contrast body and mind. Body is a structure and one of its functions is movement: brain is a structure and one of its functions is thought. We can compare body and brain or movement and thought, two structures or two functions. But when we divide the individual into body and mind (or thought) and try to compare them we are confusing what one thing is with what another thing does, the structure of one with a function of the other. We might as well try to walk down two roads at once. We are taking the first step into a maze in which we shall inevitably lose our way.

On this mistaken basis countless attempts have been made to liken body to mind. The child's place in its class-list has been studied in relation to its breathing, its examination marks correlated with height and weight, its intelligence with its age, its school successes with the total area of its skin. Yet though some of these calculations seem to show that better breathing is associated with better brainwork, no one really supposes that a broader mind as a rule goes with a wider chest. How are we to classify John's laziness, the cold he caught in the holidays, and his rudeness and impatience during the last few weeks, or Jane's round shoulders, the way she has begun to stoop, and her good report at half-term? What connexion is there between these and all the other things we know about them? Parents and teachers together find out a great many facts about a child and about childhood: some are more important than others; some can be dealt with in a short time, whilst others take months or even years of care. If those who are responsible for children are to pool their knowledge they must have a common method of sorting it for study. Facts in a heap are useless.

Let us first draw a line between what is mortal and what is immortal. When a living being dies, there is left something which has been a single form of life: this and all that it now comprises is mortal. We call immortal that part of it which is no longer there but which we believe continues to exist. (There is a tendency in modern thought to deny the possibility of a life after death, but for the vast majority a personal immortality remains not a postulate but an axiom, a thing so obvious as to require no proof.) The second step is to group our ideas as to the mortal part of a human being—the study of the nature and needs of which is the purpose of this book. When once we avoid the mistake of trying to distinguish between body and mind and begin to consider two functions such as movement and thought we come upon a possible clue.

We all know the sort of child who thinks quickly, answers hurriedly, speaks abruptly, and moves jerkily. Its style of movement seems to be very like its mode of thought. Both movement and thought depend upon groups of nerve cells, without which they cannot take place. We may say then that the way in which this child moves and thinks would seem to be due to a certain type of nerve-impulse. But all the activities of the mortal part of a human being depend ultimately upon nerve-activity, and they may all be broadly classified in a few main groups. If we study these groups and compare the way in which the actions are performed we shall be able to obtain an idea of the individual's style or technique in each of them. After making due allowance for acquired habits, imitation, training, and other factors which may fog the issue, we shall find that each of us has a personal nerve-technique—not only of walking or looking or speaking or thinking, but one technique which is common to every act, a single personal mode of being.

Nerves are not a condition or a state in which people find themselves from time to time: they are actual groups of cells connected with every part of us, to which they carry messages or impulses. They may be broadly divided into four main classes. The first to be developed, so long since that they are able to act by themselves without our control, are those which have to do with breathing, digestion, circulation, and the like: they are the nerves which have to do with what I here call living. The most recent, which we are still training in their duties, are those inside the head and elsewhere which have to do with thinking. Then there are those which run from the brain along the spinal cord to arms and legs and trunk, and order our moving. Some of these are specially practised in making (when our movements are directed on to a material of some kind): these belong to the moving group, but because of their particular work are important enough to be reclassed by themselves. We thus have four groups of nerve-activity, living, moving, making and thinking, four outlets for a single nerve-energy. They are not separate from each other, but interdependent.

Take an extreme case, that of a child of five who keeps his tongue hanging out over his lower lip almost down to the point of his chin: his breathing is poor, the muscles of his face (and especially those round his mouth) are relaxed: his speech is restricted and indistinct: he gives an impression of dullness, almost of weakmindedness. Or another, an older boy who is so rude and inconsiderate at home that his family find the holidays intolerable. Or a girl of fifteen who writes long and detailed letters about events which have never happened. We get no further by calling the girl a liar, the older boy a bully, the younger one a moron —by labelling them with a single symptom. The customary division of the individual into body and mind is equally unhelpful. The rude boy is often so violently irritable as to seem a little mad: we might group his symptoms as " mental " were it not that he has a long history of digestive trouble: yet " physical " will not include his selfishness or his tempers. When further study shows that the little child who from outside looks so dull is (inside) really quick and clever, the division into body and mind is seen to be misleading. Lastly, if we think the girl's vivid inventions are signs of an ethical fault, then neither " physical " nor " mental " will fit her case and we shall have to add " moral " and make three groups of symptoms instead of two. And since "moral" implies immoral, it will not be long before we are finding fault with her instead of finding out about her.

When we try to group what we know of these children under the head of living, moving, making or thinking, the task is simpler. The little boy's tongue hung down because nerves and muscles of tongue, lips and cheeks were out of order—all of which come under the head of moving. Though quick to understand, he was very limited in expressing his thoughts because of his poor speech. Yet, so long as his energy lasted, the quickness of his moving and of his thinking was an index of his nerve-activity at its best, of what his real self would be if and when the carriage of his face were improved. The rude boy became at times suddenly angry and so conscious of himself as to be unconscious of others, i.e. selfish. His passionate actions and words were apt to occur with some very marked discord of circulation: the nerves which had to do with living and moving and thinking were all affected by one cause.[1]

Other cases of children with special needs are dealt with in later chapters. The above will serve to show how, when we catalogue our facts in four nerve-groups, another general principle begins to appear. Each of us has a personal mode or way of using nerves, an individual style or nerve-technique which is (or should be) the same in all the groups. It is important to discover this style as soon as possible, since it is a measure of personality: when found in one or more groups it serves to show the extent of the trouble in another group. To see this technique at its best, the child should be studied whilst working at or doing something it has chosen for itself, which it wishes to do. Only in this way can we hope to find out what it really is, as distinct from what it seems to be or what it thinks others wish it to be. Examinations and intelligence tests will give us answers to questions, but the questions come from without and what we need to observe is an activity that springs from within.

The use we make of our knowledge of John or Jane, when we have classified it, will depend largely upon what we consider life to be. There is life in this world, and that other life to which death is the gate. Consciously or unconsciously each of us is pursuing a course, following some purpose. For ourselves it may be enough that we go on with what we feel we have to do, but when we begin to make arrangements for the lives of others we should at least make up our minds what we think it is to be alive. Our theory may not be correct: the important thing is that we should try to make one: we can change it as our experience grows.

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[1] The nerves which have to do with living produce more widespread activities (e.g. a blush), while the other three groups bring about more localized or more abstract effects (e.g. fingering a violin or pondering a problem or handling a tool). Yet in both the more primitive and the more recently-developed groups the individual shows the same style or technique, whether in motion or emotion.

Most people think that a human being is somehow solid and that it obtains its energy from its food. As a matter of fact, the larger part of our mortal material is liquid: we are little else than earth and air and water. When we come to examine an atom, of hydrogen or oxygen or any element of which we are made, we find it very like a solar system, in which the tiny members whirl round and about a centre and occupy a certain amount of room—using it but no more completely filling it than tennis players fill a court. The rest of the space, which was once supposed to be filled by the ether, is pervaded by radiations from many sources, e.g. the sun, the stars, the earth itself: amongst them are those cosmic rays to study which Professor Piccard and others have gone far beyond the limits of our atmosphere in a stratosphere balloon. So far from being solid, a human being is much more like a roll of wire-netting in a draught, with currents constantly flowing through it, or like dust in a whirlwind holding together for a short time among conflicting forces. In the midst of countless radiations, it may be that what we call living is a constant process of receiving and transforming and emitting an energy which comes to us from without. And though some of it may be in our food, the main purpose of what we eat would seem to be to keep our organism or life-form fitted for its duty, which is to catch and to use some part of the energy or life which streams upon and through us. That this is not altogether a fantastic dream may be seen from the explanation which Dr. Rollier of Leysin gives of the skin-pigmentation (or getting brown) of his patients during their sun cure. He says that the pigment plays the part of a wave-transformer, and that this transformation takes place in such a way that shorter rays are converted into longer ones (cf. A. Rollier, *Heliotherapy*).

The nature of short and long rays is considered in Chapter II. For the present it is enough to remember that these short rays affect principally the skin and the tissues immediately underneath it. Dr. Rollier mentions some of the others. " Besides the short-wave ultra-violet rays, which apparently lose themselves in the skin, where a part of them become converted into rays of greater wave-length, there are also deeper-penetrating rays. . . . Those of shorter wave-length are able to penetrate living tissues (ear, cheek, head). . . . The highest power of penetration is possessed by the red and infra-red rays. . . . Luminous rays as well as heat-rays can even pierce thicker layers. . . . Rays which affect photographic plates are also capable of passing through the thorax. My own trials include radiation of plates through thorax, forearm and hand " (op. cit.). That very long waves can pass right through the body can be simply proved by anyone who has a wireless set, and will stand between it and the transmitting station to which it is tuned-in. We may safely take it for granted that certain radiations are stopped by our skin, whilst others go deeper in, and still others pass right through us.

Further support for the idea of all-pervading radiations which affect living beings may be found in the following extracts from the report of an address to the Royal Society of Medicine on " Atmospheric Ionization and Influenza " by Sir William Hamer (*British Medical Journal*, 7th March, 1936) and from the discussion and correspondence which followed. " The mischief wrought by influenza tended to be specially great during the months preceding the vernal and following the autumnal equinox." " In 1902 the Abbé Thomas Moreux, Director of Bourges Observatory in France, made the suggestion that outbursts of solar activity had an effect upon the human organism. It has in recent years been shown that waves of epidemic disease covering considerable periods exhibit a very close correspondence with the phases of the sunspot periods." "Every pandemic of malaria since sunspot numbers were taken had occurred at the point when sunspot numbers were lowest, and meteorologists stated that that was a time of great magnetic disturbance of the atmosphere and variations in the cosmic and solar radiations."

Solar systems, whether great or small, hang together or cohere because they have been able to establish some sort of a balance between the forces which tend to pull them together or to pull them apart. A living organism, the stuff of which is subject to the same laws, will have the same need to maintain an internal balance between conflicting strains, constantly making adjustments and as it were tuning itself until its rate of variation, and the extent of its change, is more or less stable and rhythmic. This is true of the whole of its existence, and especially of its period of growth (from conception until about the 22nd year). The prime need of the actual material of our being is to establish an internal harmony.

In planning the education of a child, the first thing to do is to collect and classify the available data, then to form an opinion of its individual nerve-technique, and to note any discords which may need to be resolved. And first and last and all the time we must provide it with opportunities for self-chosen creative effort. Should any discord arise, the simplest way of dealing with it is to begin with a group of nerve-activities further back in the scale of evolution. For instance, a discord in thinking may often be resolved whilst perfecting a harmony in making or moving or living. Harmony in one group predisposes to harmony in another, and a nerve-technique developed in three comes naturally to be used in the fourth: it is after all the same technique.

Harmony makes self-control more possible. After leaving school, when work is very hard, or ill-paid, or unsuitable, irregular, or unobtainable, the discipline which has been imposed from without may snap, or crumble into dust. Only an inner harmony can withstand the strains of life. This will be most perfect when it is in resonance with that of an immortal spirit.

CHAPTER II

The Form of Life

No one knows exactly when or where or how life first took shape on this earth, but we have a certain amount of information upon which to base a theory. So long as earth and air and water continued to whirl round an unstable centre in a shapeless mass, the existence of anything we could describe as a separate form of life would remain impossible. But when earth became solid enough and water liquid enough and the air cool enough to be distinguishable from each other, the appearance of some simple living being would not long be delayed. Our usual standards of time are useless here: we must think in millions of years instead of in centuries. Those who have studied radioactivity consider it possible that this earth may have taken shape between one thousand million and ten thousand million years ago. This gives us a period in the past from which to reckon forward.

If we now work backward from the present day, we can form some opinion of the history of those forms of life which remain to us as fossils. These beings had a definite framework, some sort of simple skeleton or shell firm enough to leave traces among the rocks which buried them. But earlier forms still were even simpler, less solid, vaguer in outline: once covered over they would be crushed out of recognition like a jellyfish under deep sand or shingle. They might even have fallen apart in the sun and wind and rain before the earth could hide them. To reach the time when life of any kind first took shape we shall have to add to the age of the oldest fossils the generations taken by the simpler forms of life to grow the kind of framework we now find enclosed in stone or other materials. The fossilized resin, or amber, which is cast up on the coast of Samland near Danzig is said to be fifty million years old. In it are insects and plants which seem to be as completely evolved as those which live to-day. It would not seem too much to suggest another fifty million years for their infancy.

How long shall we allow for human as distinct from animal life? Fresh facts are constantly pushing the first man's first birthday farther backward. Written history is far too recent, a few thousand years at most: paintings and carvings and the remains of arts and crafts are better aids. There is, for instance, a wooden causeway discovered near Dortmund, with dovetailed joints: the layer of earth in which it was found is said to be fifty thousand years old. Pekin man is believed to have lived a million years ago. We can only guess at the time his first ancestor was born: it may have been ten million years ago.

There must have been a beginning of the earth, a beginning of life, a beginning of human life. If we think of mankind as having existed for one unit of time, animal-kind may have existed for some fifty such units, and the earth itself for a hundred of these. No such guess can be accurate, but the attempt to make it as accurate as possible is very useful. It gives us a background for our thoughts of the child of to-day, and helps us to see its nature in a proper perspective. For instance, we get an idea of the length of time during which new forms of life have been made by two parents: we can understand how old our human process of reproduction is. This should help us to realize the kind of problem a child has to face at the age of puberty. Inevitably, as the result of the experience of millions of years, entirely of their own accord and beyond its control, a group of its cells begins to ripen, and it has to adapt its altering self to the customs of a recent civilization.

Where life began is equally unknown. Extremes of heat or cold would be unsuitable. If when the earth was young the northern and southern ice-caps had not begun to form, and earth-heat and sun-heat together made the equator too hot, the polar regions might have provided a birth-place for living matter. Later on, when polar cold increased, the temperate zones would give a better chance of survival. Early forms of life may have begun and continued to exist not in one place but along a whole band or girdle round the earth's surface. The sites of very early civilizations seem to lie between 15° and 40° north or south of the equator.

How life took form is a fascinating riddle. Where earth and air and water touch each other, on the edge of some pool or beach, a deposit would be laid down. This, quivering and pulsating in the rays of the sun, might store up energy enough to become the origin of protoplasm or first stuff, lasting for a day, living between tides. Dried and wetted and tossed and blown, it would break up into smaller particles distinguishable from each other in space, repelling or attracting one another, having an individual existence. Such early forms of life may not have had an outer membrane or skin: they may have been separated from their surroundings as a drop of oil is kept apart from the water in which it floats. But the gradual development of a "skin" (not of course like ours to-day, but just an outer covering) might serve a double purpose: it would keep out forces which were unsuitable and take in those which were useful. From the very first the outer membrane would have this power of selection. Those beings which were able to absorb nourishment through their membrane and to store it inside would live a little longer: their changes of shape would become more controlled. At last these simple forms of life would master the first type of purposed movement, a growing rather than a going from one point in space to another. This stage would be reached only after countless experiments, and there would be many failures.

A cell-body which can select what to admit and what to refuse, which can also change its shape, must needs be under some sort of control. The simplest cells we know to-day have inside them a very specialized part of their substance called the nucleus. On this their whole existence seems to depend. In between it and their outer covering their protoplasm has developed a network of fine fibrils or threads. Some of these may perhaps carry messages from the membrane inwards and from the nucleus outwards. The nucleus may perhaps serve to store up some of the energy received from outside, as well as some obtained from the food. The nourishment itself seems to be stored amongst the protoplasm which lies around the nucleus. Some part of the cell must also act as a wave-transformer. Both nucleus and fibrils represent an enormous advance in evolution: possibly the earliest shapes of protoplasm possessed neither. But whatever their arrangement may have been, their activity and the very purpose of their being would from the first have been to receive, to transform, and to emit energy, to catch and use the life which streamed upon and through them from without.

Some people dislike the theory of evolution and prefer the account of creation given in the first chapter of Genesis: others think the Biblical story is out of date, and would rather have a more scientific explanation. Yet ancient and modern thought have a great deal in common. They both assume a primal energy in light, a gradual shaping of atmosphere, hydrosphere and lithosphere (or air, water and earth). Both describe as coming from the waters the moving creature that hath life (note the distinction between the life and the form). In order of growth they both place animal-kind before man-kind. When we read that the Lord God formed man from the dust of the earth and breathed into his nostrils the breath of life, or look at Michael Angelo's fresco in which God's finger transmits the vital spark into the shape of the first man, or study in a textbook of physiology the analyses of the stuff of which we are made, we find that the idea of life as distinct from form is at once ancient and mediæval and modern. Some prefer it scientifically expressed, others artistically, others poetically: whatever the expression, the thought remains the same.

The idea of life as a single radiant energy which pervades all its forms is both very old and very new. It occurs in Psalm civ, and still earlier (circ. 1360 B.C.) in that charming hymn to the God behind the sun which Akhenaten, the father-in-law of Tutankhamen, composed over three thousand years ago. To him, the sun was the vehicle of the Divine Power which made all things: its rays were represented as ending in hands which reached out towards every form of life and gave it vitality.

> "O living Aton, beginning of life. . . . Thou makest millions of forms through thyself alone. . . . Millions of life are in thee, to make them live. . . . Creator of the germ in woman, maker of seed in man, giving life to the son in the body of his mother, soothing him that he may not weep, nurse even in the womb. . . . When the chicken crieth in the eggshell, thou givest him breath therein to preserve him alive: when thou hast brought him together he cometh forth from the egg, to chirp with all his might. . . . Thou makest the beauty of form through thyself alone: for thou art duration beyond mere limbs. . . ."

Those who prefer a more scientific version of an all-pervading energy will find one in the Royal Society's chart of the "Range of Electromagnetic Waves".[1] It is a scale or measure divided into "octaves" and rather like the keyboard of a piano, but with this difference: the musical notes of a piano quiver through the air, the electromagnetic waves pass through the ether-space. The former travel at the rate of sound, the latter at the speed of light. In both, the very high " notes " have a very short wave-length and vibrate very quickly: the lower " notes " form longer waves so that their frequency per second is less. The ear can generally recognize as a musical tone a low sound made by vibrations which follow one another thirty times in a second, i.e. with a wave-length of thirty-seven feet: some ears can hear such a very high note as is caused by 40,000 vibrations per second, i.e. with a wave-length of one-third of an inch. Compared with these figures those of electromagnetic waves seem almost too large or too small to understand. The unit of their scale is an octave of sunlight, or of that part of it which affects the eye: the highest " note " in this octave is violet, the lowest is red. Above the violet are five octaves of ultra-violet: below the red there are nine of infra-red. Above the ultra-violet come X-rays (which do not pass through lead), and above these again are the Gamma rays of radium: higher still are rays which are said to be able to pass through lead six feet thick. Below the infra-red (like lower notes) are twenty-eight octaves of Hertzian waves, the last eleven of which include wireless waves. The Gamma rays vibrate 25,000000,000000,000000 times a second (and have wave-lengths around ·000000,0012 centimetre), the wireless waves vibrate a mere million or so times per second. The whole range includes (in descending octaves of radiation) radiology, ultra-violet treatment, daylight, and all visible colour, photography, heat, electric power, broadcasting, and wireless telegraphy, all of which—together with many other activities—depend upon a single electromagnetic energy.

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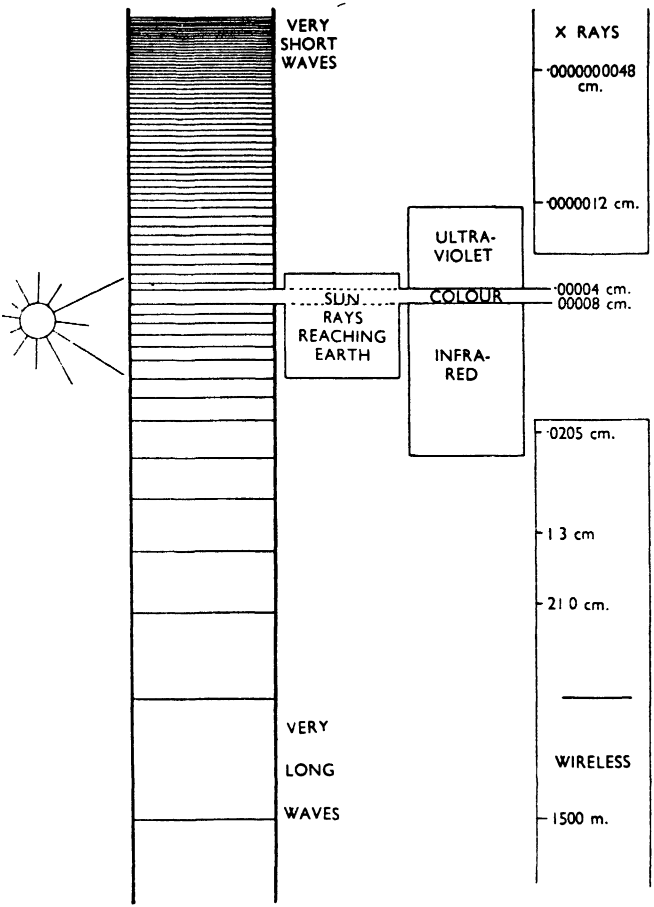
[1] Cf. *Encyclopædia Britannica*, 14th edition, "Radiation".

In 1818 Grotthus formulated the law that light is only active when it is absorbed, and that it is absorbed only when its wave-length is in resonance with those of the atoms upon which it falls. This seems very like Rollier's explanation of the way in which our skin turns brown in the sun: it may also prove to be the scientific truth which lies behind Akhenaten's poetical or religious idea of life



SOME WAVE-LENGTHS

A very simple diagram, not drawn to scale but relatively true, showing (left) the range of " waves " from very long to very short; the " octave " of sunlight (rainbow colours), five well-known groups of rays, and some wave-lengths, are adapted, by permission, from the Royal Society's Chart.

coming to the child in its mother's body and to the chicken in the egg. Religion and science are based upon a single truth.

The later chapters in our history are well known. The further perfection of the primitive cell: its combination with others: its experiments in single and dual modes of reproduction: its advance in the technique of movement: its mastery of the power to go in a desired direction: the gradual grouping of sense-control and brain in the portion of it which went first, its head: the division and specialization of its material into skin and nerves and muscles and bones and glands: the development of heart and lungs and digestive canal: the growth of limbs: these lead inevitably to that slow magnificent upheaval from horizontal to vertical which at last set free the hands for the making of beauty, and for the multiplying of memory and strength.

Just as our many parts are informed by a single energy, so this energy is directed through one specially adapted group of cells, our nerves. They are a factor common to all our activities: without them neither breathing nor walking nor craft nor thought can be carried on. To understand our actions we must know something of the nervous system which makes them possible.

PART TWO

CHAPTER III

Nerves

When we are driving across a strange country, a very simple plan of our route will serve our purpose if we have a good idea of its main features and the general direction in which we want to go. We do not need to learn by heart the details of a large-scale map. In the same way, a very simple description of nerves and their work will be enough to make us understand the enormous part they play in our daily life. We do not need to know everything about all of them. It is enough to have a general idea of their arrangement and of the way in which the messages they transmit travel from place to place. Nerves are not a condition or a state into which we get when we are unwell: they are groups of living cells, with definite shapes, which can be seen and handled, and we can draw maps of the paths or tracks which they form.

The earliest living beings consisted of one cell. They were able to change their shape and to rearrange the material of which they were made, e.g. when they reproduced themselves by dividing into two. Either by means of their membrane or " skin ", or by changing their rate of vibration (by " tuning " themselves), they must have been able to select the radiations to let in, to transform, or to send out. It seems reasonable to suppose that cells still possess these powers in varying degree, even though they form part of a many-celled being and have lost their individual freedom of movement.

Single-celled organisms went from place to place by growing rather than by going: they pushed out part of their shape in one direction and then dragged the rest after it. The colourless corpuscles in our blood still do this, pushing out pseudopodia or rudimentary feet from whatever part of their outline is most suitable, and pulling them in again. They are partly carried along in the bloodstream, and partly they move of themselves like swimmers in a current. At times they even pass through the walls of the blood-vessels into the surrounding tissues. Seen through a microscope, if the glass covering the corpuscles is lightly tapped, they draw in their " feet " and become spherical in shape (cf. Sharpey-Schäfer: *Essentials of Histology*, p. 70).

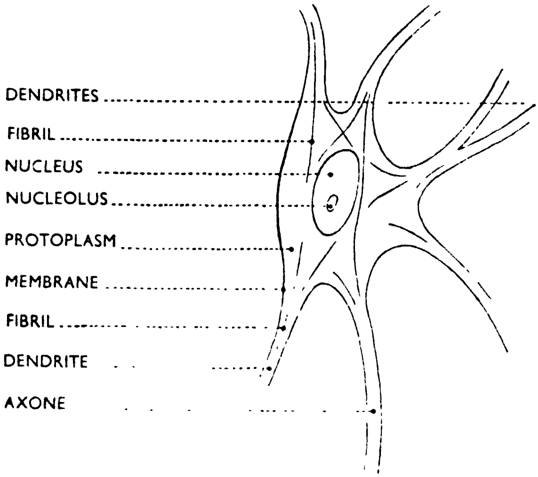
A later development would seem to be to push out one part (a projection or process) and to leave it out as a kind of limb or tail. There is a single-celled organism of this shape called noctiluca (shining by night), a phosphorescent being which lives in the sea. Its projecting part or process is called a " cilium " or eyelash and is curved like one: it is thought to be hollow. By straightening out slowly and bending quickly it gets a purchase on the water. Its action is so simple that it is extremely hard to understand: perhaps the cell-body contracts and forces some of the liquid of which it is formed up into the " tail ". Other cells have a projecting part which can bend in two directions or more, and is called a " flagellum ", or whip-lash: this acts like a scull at the stern of a boat. Some parts of our bodies are lined with "ciliated" cells with movable projecting parts, e.g. the air passages in the lungs. The bodies of the cells have combined to form a lining and do not move, but the cilia are quite free. They keep up a constant fanning movement, and thus cause a current in the moisture on the walls of the air passages, pushing it towards the air-inlet and the throat, together with any dust which may have been breathed in (cf. Halliburton: *Physiology*, 1937, p. 9).

When many cells live together as one being, most of them lose their freedom of movement, but develop other powers and take on special duties. Some combine to form bone or cartilage or muscles, others make and give out fluids, others receive and send messages. Whatever their present work may be, it is based on long practice in the past, and results from the special use of the general powers which the earliest and simplest cells possessed. Through millions of years they have made themselves into what they are. Those which are highly specialized, such as the nerve-cells, lose the power of reproducing themselves but gain that of receiving and transmitting impulses or stimuli, and their selectivity is enormously increased. They still push out projections or processes towards and among those of others: this takes place during the early life of the child, both before and after birth. Inside these processes there is some of the cell-material, rearranged to suit its new work. The protoplasm contains very fine fibres (or fibrils) which lead toward or away from the nucleus and sometimes link up with fibrils from other processes. Round about the nucleus they are interwoven into a sort of basket or network. More complicated cells seem to have two other networks, one near the surface and one deeper in, with a series of tiny canals which may be concerned with the supply of nourishment.

The simpler nerve-cells have two processes, the more complicated may have very many. Some of the latter look like an octopus, others (in the little brain or cerebellum) like the branches of a shrub in winter and with a single root: others, in the part of the brain which is nearest to the skull (the cortex or bark), resemble a closely planted forest of thin trees, their topmost branches spreading horizontally and seeming intertwined: their trunks have shorter branches.

Below these, like the seeds from which they have sprung, are the main bodies of the cells, from each of which there passes a single root down into the deeper cell-layers. Some processes are short, others much longer.

Nerve-cells vary in size and shape: some are amongst the largest cells in the body, others are very small. Small



PARTS OF A NERVE-CELL

and large are relative terms: an idea of their actual measurement may be gained from the fact that there are twelve thousand million in the brain alone. Yet none of the cells actually touches another: there is always a tiny space between them. In the brain they are grouped together in a mass: in the body they form long threads or strings leading to the various parts which they control. Some of these can be felt from outside: one, a fairly thick one, lies under the skin on the inside of the elbow-bone. A nerve-cell, main body and all the processes included, is called a neurone.

All nerve-cells have at least one process: it is called the nerve-fibre process or axon, and carries the messages away from the cell. Where there are two or more processes one is the axon; the others are the dendrites, or branches, which collect or receive messages and forward them to the cell. The " branches " transmit toward the cell: the " root " carries impulses away from the cell. Perhaps each nerve-cell generates new impulses. In the motor nerves which control movement the message goes from dendrites to axon: in the nerves which carry sense-impressions (sensory nerves) the message goes through the nerve-cell from one nerve-fibre process to another. Practice in this life, added to the long experience of the past, develops the habit of sending the nerve-messages through the neurone in the same direction: it is the principle of the one-way street.

Nerve processes are very small, the largest being less than $\frac{1}{50}$ mm. and the smallest less than $\frac{1}{500}$ mm. thick. That they can be seen at all is due to the microscope, and to the fact that certain parts of their material will take certain dyes or stains, and can then be distinguished from the rest. In this way it has been possible to learn much about the way they are made, but how they act under natural conditions is still unknown. By placing one terminal from an electric battery and coil on the back of the neck, and the other on the inside of the lower arm, it is easy to make various muscles contract and bend finger after finger. Presumably the current passes along the nerves from the spine and down the arm into the chosen group of muscles. But this only proves that certain electric currents will make nerves work: it does not prove that nerves naturally work in this way. A very common experiment is to dissect out a nerve in a living organism such as a frog, and apply the current directly to it in order to study the action of the muscle to which it leads. This introduces factors which are quite unnatural, either the effects of an anæsthetic drug or, if none be used, the results of extreme anxiety and pain. Whilst in its natural position and state a nerve cannot as yet be distinguished from the surrounding tissues by X-rays.

Some day perhaps a combination of stereoscopic lenses and some of the deeper penetrating radiations may make it possible to study nerves in their healthy state. Until then we must be content to make the best guess—or theory—we can as to how they work. Very possibly their mode of life is a simple one, the apparent complications being due to the enormous number of cells and their extreme delicacy. Dr. E. D. Adrian says they all seem to do their work in the same way, with an activity in some respects remarkably simple—essentially rhythmic, alternating rapidly between the resting and the active state (due probably to rapid breakdown and repair of the surface). He regards the impulses in a given fibre as all alike in amplitude and rate of travel, but varying in frequency from 10 to 300 per second.

The nature and needs of the nervous system are factors of vital importance in any scheme of human co-operation, and it is particularly necessary for parents and teachers to have a theory of some kind on which to base their practical dealing with children. It may not be correct in every detail: it can be changed as new facts are acquired: what matters most is that we should try to make such a theory. Putting together what we know of the simpler cells and of their more recent developments, and testing each step in our reasoning by whatever general knowledge we may have of life, we may venture to form an idea of what is happening in the nerves of those with whom we live and work.

Consider the condition of a neurone which is about to act as part of the path of a nerve-message. It will already have its own vibration-rate, due partly to the energy it has admitted from without and partly to its own substance or material. It must contain enough nourishment for its needs and be able to obtain more. The blood-vessels must bring it enough oxygen to enable it to work, and must be ready to carry away its waste products. To receive a message it must be able to tune itself to the vibrations of a neighbouring cell. If it has several dendrites it must so tune itself as to receive one message and reject others. When this is done, the impulse can be forwarded along the dendrite toward the nucleus, where it may be transformed and a new message sent on by way of the axon. The nature of the impulse must be such as to pass across the gap between the end of the axon and a dendrite of the next cell. Its work done, a period for the cell's repair or recreation of its own tissues, and for the recovery of its own rate of vibration when not actually receiving or transmitting, will be necessary. After or even during this period another impulse may arrive, to be dealt with in a similar way. If we consider the speed of thought or the almost instantaneous rate of some of our movements, we shall realize that the time taken for the various stages of a nerve-cell's activity is infinitesimally short.

The speed of a nerve-message along a path made up of many cells has been calculated to be about a hundred feet a second. It seems, however, to vary greatly with practice, with the early stages of fatigue (when it may increase), with cold or exhaustion (when it is slower), in anxiety or fear (when it may be faster, or misdirected, and its original strength dispersed). It also varies in individuals, or in the same person in different states of health. An expected stimulus may be transmitted more quickly than an unexpected one, and vice versa. An undesired one may be refused, or " tuned out ", and not received at all. In the case of an impulse which might be generated in a cell from radiations coming from without, perhaps the cell may maintain its usual vibration-rate and allow the radiations to pass through it, or so change its rate as not to receive them: the possible impulse will then not be generated. (This may be the basis of what we call relaxation, and of a technique of self-control.) A message may be received and —for one reason or another—not sent on. (This may be connected with what is known as inhibition, or with repression.) In certain conditions of anxiety or fear, the habit of sending the message in one direction—from dendrite towards axon or, in sensory nerves, from one nerve-fibre process to another—may be lost. The rule of the one-way street is broken: the ordered sequence of rhythmic impulses may change to a surging disorder. (It may be that this is the basis of some of the functional paralyses which were so common during the War, and of many of the disorders of childhood which are classified as mental deficiency or backwardness.) Fear is a little death, and should be removed from childhood wherever found.

Broadly speaking, we may say that nerves reduce as well as increase stimuli from without, adapting them to their own delicate structure. The discharge of energy from cell to cell will ordinarily be minute. Whatever the mode of transmitting it may prove to be, the passage of a nerve-message implies an emission of energy and a rearrangement or change of substance. Amid these efforts of discharge and renewal, of loss and gain, the preservation of the cell will depend on its power to maintain and re-establish stability between conflicting forces. For such an organism harmony is essential to health, and discord—if too great or prolonged or too often repeated—will be injurious.

Just as a neurone has three divisions, dendrite, cell-body and axon, so the nervous system as a whole has three main functions: to take in, to choose, to give out (to receive, select and transmit). Under these three heads we may very usefully group much of what we come to know about a child. To take an extreme example: infantile paralysis may be classified as an interference with transmitting or sending (motor nerves). Deafness—where the ear is at fault, or blindness—when the eye has failed, may be called failures in receiving. Mistakes in selecting or choosing from among many stimuli include many errors in school work, wrong answers to questions, and so on: they occur in what are called associative nerves. They are fairly easy to detect in moving and in making, and their causes can be quickly discovered; but in thinking they are more difficult to deal with. So many grown-up people are content to find fault, so few have time to find out. Yet somewhere among the nerve-paths there may be a cause. Just as each of us has a preferred sense, one being better with the eye, another with the ear or with the sense of touch, so most of us have a likely source of error, of failure in nerve-technique, the discovery and correction of which would be most valuable. It is a tragedy that in so much of our education we are taught to think of a mistake as something to be underlined instead of as something to be understood.

A very common mistake, which constantly appears in moving, is caused by the nerve-message intended for one set of muscles being accompanied by or changing over into a message to another group of muscles. Most of us have watched the early experiments by which a baby learns to contract the right muscles at the right time, to send the proper message along the proper nerves. Our joints are moved by muscles which bend and muscles which stretch them, closing them and opening them rather like a blade of a penknife or a pair of compasses. Flexors and extensors do opposite work and are called antagonists or opponents. Should a message to the flexors be accompanied by one to the extensors the muscles will try to bend and to stretch the joint at the same time. If the messages are of equal strength the joint will be fixed, will become stiff and rigid. If the flexor message is the stronger, the joint will be bent, but expensively, because of the energy taken up in overcoming the work of the extensors. This waste of nerve-energy is extraordinarily common at the present day, especially amongst the more highly civilized peoples. It is a mistake in nerve-technique. In very marked cases the slowness or irregularity of the movement, or the rigidity of the joint, may be mistaken for a symptom of paralysis. It may also happen that a nerve-impulse intended to cause a certain movement may not be discharged, or may be scattered among several groups of nerves, thus producing either no movement at all or a more or less widespread quivering. This faulty technique may also occur in the nerve-cells concerned with thinking. It may be that the question to be answered has been vaguely phrased, that the child is over-anxious to do well. For these or for some other reasons there may be a long pause before answering, a wrong answer, or even no answer at all. There is a kind of paralysis of thought, which is frequently mistaken for stupidity, inattention, laziness, or even for mental deficiency, instead of being recognized for what it is, a nerve-lock. The apparently dull child, behind a still and stolid exterior, may be seething with nerve-impulses seeking for discharge, which for a time it may be unable to direct along the proper paths. This banked-up energy turns in upon itself and either becomes repressed or, bursting its way out, causes a clumsy movement or a " stupid " thought or a wrong answer. The disturbance is not limited to thinking or making or moving, but spreads over to the nerves which have to do with living. Pulse and breathing rate may be altered, or digestion or excretion interfered with, or the activities of glands thrown out of balance. (The broad distinction between this group of nerves and the other three should always be borne in mind: their duty is to produce widespread general effects whilst those of the others are more localized.) Here is a field of research to which the mere numbers of a class —especially with younger children, who are the more likely to suffer in this way—often shuts the gate. The key to the nerve-lock may often be found in movement, especially if this be informal and happy (harmonious). The value of a smile, and the answering smile it may call up in the child, is always worth remembering.

Given reasonable conditions of existence, the older-established nerves which control our living may be expected to tolerate discord better and to be able to recover harmony more quickly. It is so long since they made their habits that they continue to do their work without our help. On the other hand, the nerves we use in our conscious thought are still experimenting in their duties. The more suited they are to their work, the more delicately sensitive they are and the more quickly deranged. When we realize that the individual has but one nerve-technique for all four groups of nerve-activity, we shall understand more easily how a disturbance of technique in any one group may pass over into any other, e.g. a discord in thinking may spread to living. (Many of us know how worry affects our digestion.) A child with a careless or slapdash mode of thought may show a clumsy abruptness in making, a jerky or spasmodic way of moving, an irritable or irregular digestion. Fortunately a technique improved in one nerve-activity means an improvement in the technique for all.

In planning the education or re-education of a child (or an adult) we have not only to aim at correcting existing errors of technique: we have also to make sure that we cause no fresh errors, whether by our organization of the work to be done or by our methods of teaching. Each of us has a maximum beyond which our nervous energy does not ordinarily rise, and a minimum below which it should not be allowed to fall or to remain. Instead of constantly demanding a maximum expenditure and thus proportionately lowering the minimum, we should aim rather at an optimum output for each individual, a best for the person concerned instead of a better than that produced by someone else. We fall too easily into the error of judging by the thing done instead of by its doing. The essay, the sketch, the calculation, the object made, is after all a by-product: it may have an examination value, even perhaps a sales value, but it is an ended thing. What persists is the change which takes place in the worker whilst working. If this is to be a best, it must be best not merely in quantity or speed of output, but in quality of the reception and in delicacy and sensitiveness of the selection which went to the effort of creation, together with an improvement in the power of self-tuning which in time helps to make it almost undefeatable. Our aim should be to perfect the internal harmony not merely of one group of cells but of the nervous system as a whole.

CHAPTER IV

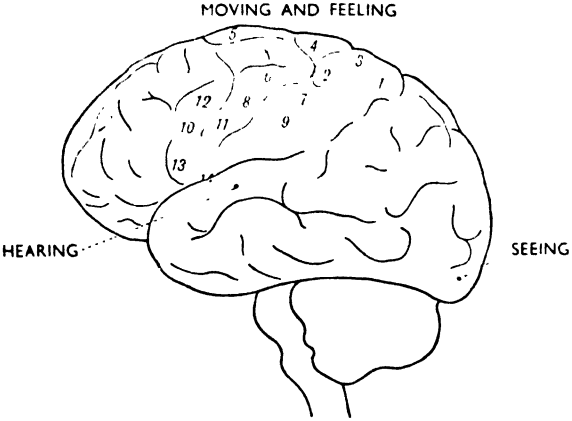
The Brain

Where a living being consists of a single cell, the nucleus seems to act as a centre of control. Where two or more cells combine to form an individual, they come to a common arrangement of their material and specialize in different activities. Those which develop into nerve-cells link their energies together by means of their processes and become the nervous system. In an organism engaged in mastering the technique of moving forward in a straight line, this would be best placed in the middle in order to control both sides—whether the sides worked together like those of some caterpillars, or alternately like those of a snake. The group of cells which as a rule went first would become the head, the others would form the body. The first group would come in contact with whatever happened to be in the way, and would gradually develop some means of receiving and acting upon the impressions or stimuli thus obtained. Touching and smelling and hearing and seeing would come to be the work of special groups of cells with special powers, one set of groups for each side, with communicating processes or cells. The remaining nerve-cells would have to do with the rest of the organism. In this way the brain and the spinal cord would come to form a central nervous system, receiving messages from all parts, sorting them out, and sending others as need required.

When a being is composed of many cells, some will be near its outside and others farther in. The outer layer is nearer to the external world and receives all sorts of impressions from it, radiations of light and heat and pressures from air or water or earth. Some of the cells in the outer layer become more sensitive and others less so: the former develop into nerve-cells and the latter into skin-cells. But nerve-cells on the very outside would be too exposed: they would be safer if covered by skin-cells. Those grouped along the middle line would run less risk if they lay in a groove. If the groove became so deep that the edges of its sides folded over and touched and grew together, the central nervous system would then be inside the organism and enclosed in a tube. Later on the tube separated from the outer layer of cells and took up a position farther in. A second layer of cells then surrounded it and developed into a firmer and more protective substance which we call bone. In this way the brain and the spinal cord became enclosed by the skull and the spine, and the process is repeated during the early stages of growth in each child. Between the bones of the spine are spaces through which nerve-paths from the cord lead to and from various parts of the organism, and just after passing through these spaces these nerve-paths are linked up with those which are concerned with regulating the processes of living.

In simpler forms of life the brain is arranged as it were on a ground-floor or bungalow plan, all on one level. In front are the centres for smell, then come those for hearing and sight: behind these are cells which sort out nerve-messages to different nerve-paths and receive messages from them. The early shape of an embryo human brain has three main parts, fore brain, mid brain, hind brain, one after the other at the front or head end of the spinal cord. As more cells developed these parts grew in size, and changed their shape. The old grouping remained as a basis of the general brain plan, on the outer surface of which the newer cells were arranged. The fore brain in particular increased in size and became higher and more rounded, so that its two halves (one for each side of the body) almost touched one another, and both together curved backward over the mid and hind brain until these were almost entirely covered. As still more cells developed, to meet the need of the new activities of the organism, crinkles or grooves in the surface of the brain were formed, around which the new cells clustered in groups. Just as a piece of paper crumpled in the hand has the same area as when it was flat, but fills less space, so these folds in the material of the brain provided a larger surface in a more compact shape. The folded outer layer of nerve-cells in our brain is called the " cortex " or bark. Its grooves or wrinkles are arranged on a definite plan, and occupy much the same position inside the skull in all of us.

If we place a finger-tip on a given position on a head, we can say with some accuracy that it is just over a group of nerve-cells connected with an eye, a hand, or an ear, and so on. If we part our hair in the middle, the comb passes from back to front just over the deep division which lies between the two halves of the upper portion of the brain. (The left side of the brain controls the right side of the body and vice versa, with nerve-paths linking them together: the controlling nerves pass over to their proper side before leaving the skull.) If the line of the parting be continued down over the forehead towards the bridge of the nose, and backward to where the skull ends and the neck begins, it will mark off the hemispheres of the brain. Next find its middle point, on the top of the head, and on this lay the tip of the first finger. Keeping this there, place the ball of the thumb on a point half-way between the outer corner of the eye and the opening of the ear. The first finger will then lie along the skull roughly above one of the most important folds of the brain, called the fissure of Roland. This fold makes an angle of about 67° with the middle line, and slopes forward and downward for about 3½ inches. A more accurate way of finding its position is to lay a narrow strip of adhesive plaster lightly from the bridge of the nose along the middle parting to the small lump of bone at the back of the skull just above the line of hair where the neck begins, and a second strip from the mid-point of the first strip to the point on the skin half-way between eye and ear. Do this on the left side of the head and you will have marked not only the groove which separates the two halves of the brain but also the main wrinkle or fold in the left half, the nerves of which control the right side of the body.



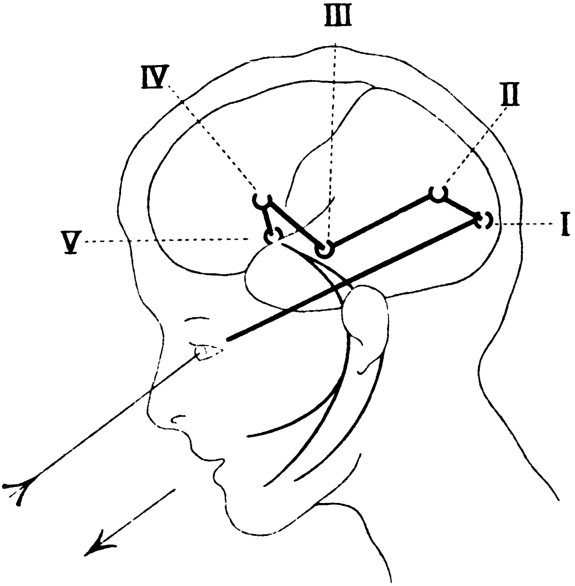
SOME NERVE CENTRES IN THE BRAIN

1. Toes. 2. Foot. 3. Leg. 4. Thigh. 5. Trunk.
6. Shoulder. 7. Elbow. 8. Wrist. 9. Fingers. 10. Eyes.
11. Face. 12. Head. 13. Tongue. 14. Throat.
(*Note.* Feeling here means sensation, not emotion.)

Near the point where this groove starts from the middle line are groups of cells which have to do with the trunk, thigh, lower leg, foot and toes. Downwards along its course are those concerned with the arm—shoulder, elbow, wrist and fingers: with the head and the eyes: with the face, tongue and throat. This last group comes at the lower end of the fissure and forms a centre of nerves which control speech. Along the corresponding fissure on the right side of the brain are the cells which deal with the left side of the body, in the same order. One edge of the strip of plaster is nearer to the eye, the other to the ear; one side of the fissure is nearer the front and the other nearer the back of the brain. The areas for the parts of the body lie on both sides of the fissure, cells for sending and cells for receiving messages grouped into motor and sensory centres. Between the centres, and also going from one side of the fissure down to the bottom of the valley which it forms and up the other side, are nerve-cells and processes which link together (or associate) the areas and centres.

If you knock your left elbow against the edge of a door you snatch it away and rub it with the right hand. This very simple action means that a nerve-message has passed along the left upper-arm, into the neck and up the spinal cord, over to the right side of the brain to the elbow sense-centre on the fissure of Roland, across to the elbow motor group of cells by an associative nerve-path, and down by a parallel path to the muscles of the shoulder and arm which snatch the elbow away from the door. From the same sense-centre another message is sent by a longer associative path to the opposite (left) half of the brain. Arriving at the elbow-centre for the right side, it is relayed through arm and hand centres to nerve fibres and threads which arrange for the right hand to rub the left elbow. It will be plain that several nerve-paths and many cells combine in this simple action. If we were using both hands and both arms in writing a letter, the number employed would be infinitely greater. One hand holds the paper, the other holds and moves the pen: the eyes see what we write, the eye-centres remember the shape of the words, and the ear-centres their sound: other nerve-cells combine to help us in thinking of what we wish to put down on the paper. Hundreds of thousands of tiny nerve-cells and their processes are at work. Different areas of the brain combine: each area is linked up to the others: they all work together as a whole.

The various parts of the brain have to do with various activities. This is very natural, since the separate groups of cells grew with and specialized in the new developments of the organism. There appears to be a fairly definite brain-geography, with fairly well-marked areas. In certain illnesses or accidents (knocks, wounds or bruises) certain nerve-centres may be damaged: when this happens, certain activities are interfered with or even completely stopped. Sometimes an operation to relieve pressure on the brain (such as raising a piece of bone which has been pushed inwards) will restore the lost power of movement. A fall on the back of the head may interfere with the sight-centre (we most of us know what it is to " see stars "). The use of the right arm may be lost, or of the left leg. We may be able to hear sounds with our ears, and to move our mouth and throat and tongue in swallowing, and yet be unable to speak words, though we still understand what other people are saying. This is not a mouth-dumbness but a brain-dumbness, a loss perhaps of a word-hearing memory or a damage of the associative nerves between ear-centre and speech-centre. The infinite complexity of the nerves in our brain is almost beyond imagination. Yet it is built up of very simple elements working in a very simple way, with very simple needs. Each cell has to receive and select and transmit messages (i.e. has first of all to maintain its normal wave-length whilst at rest, then has to change this as occasion requires, and, last of all, must re-establish this between one piece of work and the next). It needs proper nourishment, proper practice in its duties, proper rest. The rhythm of expenditure and recovery must not be unduly disturbed. We shall see later how far our systems of education and re-education are based upon these needs. Meanwhile, it is worth remembering that, large though the brain of an infant may seem at birth in relation to its body, it is not yet fully grown. The various parts are there, the folds or fissures are completed, but the cells have to learn to work together and the brain has to increase in volume to that of an adult. At birth its volume is 25 per cent: at one year, 63·7 per cent: at two years, 72·5 per cent: at four years, 80 per cent: at thirteen years, 91·1 per cent. Thus the child, particularly during its early years and for part of its school life (for all of it if it is in an elementary school) has not only to learn to use its brain but to grow it whilst using it.



NERVE PATTERN IN READING ALOUD

From eye to I centre for seeing, II word-seeing memory, III word-hearing memory, IV word-saying memory, V speech centre, to tongue and lips.

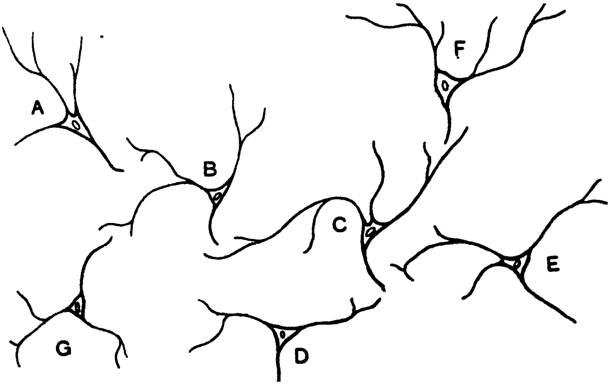
(*Note.* Brain centres modified from Starr, *Organic and Functional Nervous Diseases*, 3rd Edition, p. 137, by permission of Messrs. Baillière, Tindall and Cox.)

It is worth while trying to draw a plan of the brain-work which takes place during a simple school process, such as reading aloud from a book. The eye sees the printed words, and its nerves send messages to the eye-centres at the back of the brain. These are then linked up with those ear-centres which specialize in word-hearing (so as to remember the proper sounds). These again are associated by other nerve-paths with the motor speech-centres for face, lips, tongue, throat and voice-box (with vocal cords), to which messages have to be sent. The muscles which have to do with breathing are also concerned, since speaking is no more than an interruption of or interference with the air as it is breathed out. This means that a whole group of cells which are accustomed to act by themselves in breathing in and out have to be brought under conscious control, and their work timed to fit the words and sentences we wish to pronounce. The task of learning to read aloud may seem a very humble or simple one: in reality it is delicately complicated and full of possibilities of error. Shyness or anxiety or an over-conscious wish to please may easily make the timing of breathing change, and produce a hesitation or a stammer. A better mind-picture of the thousands of nerve-cells striving to tune themselves and to send proper messages along the proper paths will help us to be more patient and more understanding in our teaching. We need to remember that we are not aiming at a maximum output of energy but at an optimum, a best. A rough-and-ready rule for securing the proper timing of nerve-messages is that the child shall be happy at its work.

To get a still clearer idea of the work of a brain, consider four nerve-cells A, B, C, D engaged in sending a message from A to D. It passes along the axon of A to the point where this is near to one of the surrounding dendrites of B (this point is called a synapse, and is almost but not quite a contact). The B dendrite, tuned in to A, receives the message across the gap and forwards it to B nucleus, from which it passes along B axon towards C. Other B dendrites may be receiving messages from other axons (such as that of G): these have to be stopped, or tuned out. The message passes the BC gap and is forwarded towards D. It may be that an

E dendrite is as ready to receive it as a D dendrite. In this case it may be sent to E as well as or instead of to D: this would cause a mistaken movement or a wrong answer. Practice may ensure its always going to D and not to E. In this manner habits are developed and mistakes caused or corrected.

As the various nerve-centres became better known, they were thought to be definite areas, as distinct from each other as counties on a map. The paths connecting them were—and too often still are—compared with the telegraph wires between different exchanges. (It is always unsatisfactory to liken a living organism to a lifeless machine.) The existence of special centres is still taken for granted, but it is felt that too much has been made of their localization. Dr. Adrian states that cases frequently occur in both men and animals in which actions clearly do not depend on



MAP OF A NERVE-MESSAGE

To send an ABCD message the nerve-cells A, B, C, D must be " tuned " to each other, and an F or G message must be " tuned out " or refused. If the message is to go to D and not to E, then E must refuse it (i.e. be tuned differently).

(*Note*. This is merely a diagram, not a picture.)

particular neurones, but on those which are called upon to take up the duty. This would seem to imply that the cells are not all predestined to become part of this or that centre or path, and that they have a certain power of adaptability. This, if true, will have a direct bearing on re-education, in which lost powers may be partly regained by the use of alternative routes. It may also mean that individuals may organize their associative nerve-paths differently, and that though the general result may be the same the details of their nerve arrangement may vary. This would make our nerve-technique more than ever a personal matter. Instead of imagining a few groups of cells acting in complete isolation from the rest with a more or less mechanical efficiency, it is probably more correct to think of many groups pulsating with an energy which surges here and there until a required potential is reached, and is then discharged along a chosen (or chance) path. No detailed and accurate description can be given of the brain in action. If, however, we imagine each group of cells as giving off a different colour, we may picture a kaleidoscopic blending of light until the required shade is obtained, followed by an immediate and flashing discharge. The actual mingling of wave-lengths from various cells and the process of tuning to them may be an even more delicate affair than mixing the colours.

This introduction to the study of the structure and functions of a brain is pitifully slight. It may, however, serve to show that what we call mental activity follows definite lines, is subject to definite laws, and is not the hopelessly intangible thing we have imagined. There is no more reason to be afraid or ashamed of " mental " trouble in a child or an adult (or in ourselves) than there is to dread measles or scarlet fever. There are causes and there are effects: given sufficient study and patience we can find out and deal with them. Only, we must first understand the amazing delicacy and sensitiveness of the brain and the swiftness of its reactions: we must take very much more care over little things: we must be content to wait. Though habits are very quickly formed they are only slowly separated into their component parts and recombined. A stable mentality cannot always be attained by the end of term, sometimes not even by the end of school life. Few children have never been ill. When we remember the minuteness of a single nerve-cell and realize how dependent it is for its existence upon a proper blood supply, when we think of the tiny blood-vessels by which it is served, we can realize that something far less drastic in its effects than " sleepy sickness ", or a meningitis following middle ear disease, may affect its health. We shall begin to pay more attention to the results of knocks or falls, of digestive troubles, " chills " accompanied by a temperature, heat-stroke, and—last but not least—the common cold. Not until all these and many other simple causes have been ruled out need we suspect " mental " trouble. When we do, and if we are correct, we shall be the better able to cope with it the more we understand of the working of the brain. Very probably we shall find some quite simple mistake in nerve-technique which we can help the individual to overcome.

There are said to be twelve thousand million nerve-cells in the brain. From among this crowded mass of tiny living organisms a group or a series is ultimately formed, along or through which a message is sent, for action or for thought. Just before this final selection there is a period in which countless cells may offer stimuli, may try to discharge energy, may be tuned in or out. Such a period occurs when a diver standing at the end of a board is just about to take off; but the nerve-activity here is slow and simple when compared with the almost humming-bird reactions which precede a careful answer to a question. Disturbances from without, e.g. a noise or a bright light, a frown or an impatient movement or a laugh, may cause a mistake to be made. How much more then may an inner discord between the cells themselves add to the difficulties of the task. Among internal discords perhaps the most powerful is anxiety or fear—anxiety to please, fear of doing badly, of being punished, of seeming foolish or stupid, and so on. It may be entirely groundless, imaginary, even silly: all these are beside the point. The ruinous results of such a state, whether in child or adult, are far too little understood. (Some examples are given in a later chapter.) That either fear or anxiety should be consciously and deliberately used, whether in education or industry, as a means of compelling obedience or preventing a mistake, might seem absurd, were it not so inexcusably unskilled, or lacking in imagination, or purposed in its menace, or—worse still—so lazy. It may often be easier to find fault: it will always be better to try to find out.

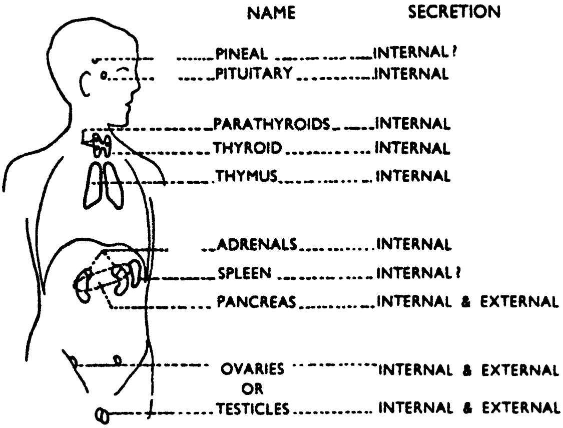
CHAPTER V

Growth

Growth is more than an increase in height and weight. Changes in these are the outward signs of a very delicate inner process—the attaining of a glandular balance.

Just as nerve-cells have developed a special power to receive and send messages, muscle-cells to contract, bone-cells to resist pressure, and red cells of the blood to carry oxygen, so certain other cells have combined to make and pour out fluids of various kinds which are called " secretions ". Such groups of cells are called glands, e.g. the tear-glands which keep the eye-balls moist, or the salivary glands which pour their juices into the mouth, or the sweat-glands which get rid of waste products through the skin. The digestive canal is lined with groups of such cells: they form little recesses or tubes, from which their special products overflow through a tiny opening or mouth. Because these glands pour out their contents into the body-cavity or space of which they form the lining, they are called glands of external secretion.

There are, however, certain other glands which have no such opening and are not directly connected with any body-cavity. As the blood flows through their tissues it picks up their products in its stream and carries them along with it to other parts of the body, very much in the way that the water one uses to get rid of a drop of ink on a garment carries away a stain. This type of specialized cell-group with no duct or opening is called a gland of internal secretion, an endocrine gland. Travelling along in the blood its secretions act like messengers, arousing other cells to do their special work, even at some considerable distance; a gland in the head, for instance, may affect one in the neck or another in the lower part of the body. These gland-products which call other activities into being are known as "hormones" (or arousers), whilst others, which reduce or put a stop to activities which already exist, are called "chalones" (or slackeners). The interaction of these glands makes their proper working a very delicate matter. When suitably balanced they bring about the orderly inward changes of childhood which we call growth, of which increases in height and weight are outward signs. After growth is ended they settle down to their long task of keeping the grown-up body stable throughout the rest of life.



SOME GLANDS AND THEIR WORK

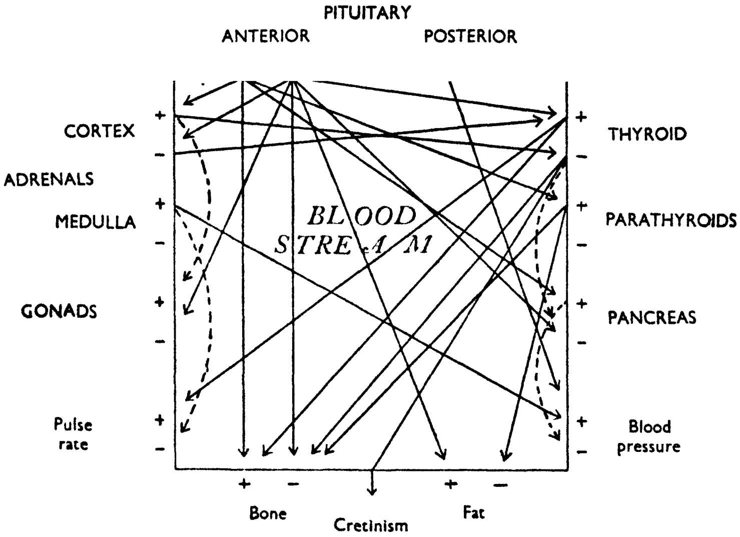
The position of some of these glands is shown in the accompanying diagram. The pineal and pituitary are inside the head, among the central folds of the brain. The two wings or lobes of the thyroid are in the neck, above the collar-bone and close to the "voice-box", forming with the part which connects them something rather like a bow tie in shape and position. Behind each "wing" of the bow lie the parathyroids. Below the collar-bone and inside the chest, just beneath the upper ribs and the breastbone, is the thymus. The top part of each of the kidneys, on either side of the back-bone about the level of the lowest ribs, is capped by another endocrine gland, which from its position is called supra-renal (above the kidney), or adrenal. The pancreas, and the ovary and testicle (reproductive glands, or gonads), make secretions of both kinds, the internal passing into the blood and the external into a body-space. Whether the pineal and the spleen have an internal secretion is not yet clear.

The pineal body was once thought to be the seat of the soul: later on it was considered as the remains of a third eye. Some theosophically minded persons hold that in the future it will accommodate a seventh sense (the power of divine insight), whilst the sixth (psychic receptivity) is placed in the pituitary. Liver, spleen and kidneys have each at one period or another been imagined as the home of such moods as melancholy, jealousy or rage—thymus and thyroid as reservoirs—the reproductive organs as symbols of life. Accurate knowledge of the structure and functions of the glands of internal secretion is still incomplete: new discoveries are made each year, almost from day to day. (The most comprehensive work on the history and progress of the subject is Sir Humphrey Rolleston's *Endocrine Organs in Health and Disease*: 1936). But even the slightest thought about their intimate connection shows that their delicate balance needs time for adjustment and may fairly easily be disturbed, and that during many years a child may need respite from conscious effort and times for rest and recovery if growth is to be successfully completed. The following slight outline of their work may give an idea of the way in which one of them may affect another or others and of the results which may follow their combined work.

To produce its proper effect a gland must make a secretion of good quality. The salivary glands, for instance, must give out good saliva if digestion is to be good. When they are kept constantly at work, e.g. when their owner is always chewing gum, they are not likely to make such a good product, however much they may pour out. If two (or more) endocrine glands are to work properly together, the first must send an adequate message to the second, neither too much nor too little, but enough. Too much or too little will depend on quality as well as quantity of output from each of the pair, as judged by their combined effect. Glands which co-operate must be thought of as partners in a work which should itself be a unity. If the first gives a proper output but the second fails to do so, the first may be said to be plus in relation to the second; but it may also be regarded as plus if for some reason it becomes overactive while the second is still working normally. The rhythms of growth are the outcome of constantly changing relationships between these glands.

Pituitary.—This gland has two divisions (lobes), anterior and posterior. The anterior lobe, plus, causes greater growth of bone accompanied at times by slow development of the reproductive glands (as in some tall and childish youths and girls). If this lobe is minus in effect, growth in height becomes slow (even to the extent of dwarfism) and development is retarded (even to infantilism) and fat may increase —though some think this due to another part of the gland. The posterior lobe's secretion stimulates activity in plain or unstriated muscle-tissue (which acts involuntarily): it also affects the kidneys. The interrelationships of the gland as a whole and its effects are so numerous that it may almost be considered the most important of the endocrines. But it should be borne in mind that these effects are joint products, and that though, for example, pituitary and thyroid combine to affect growth, the proper result is not obtained should either of the two glands fail.

Thyroid.—A plus of activity is accompanied by a nervous excitability and a faster heart-beat. More oxygen is used up and more carbon dioxide given off. With a minus activity, bones grow more slowly, muscles and nerves are less efficient, and mental development is slow, even to the extent of cretinism. In goitre, the gland grows larger and the eyes may be affected. The thyroid is interrelated with the reproductive glands. It is concerned with the chemical changes of iodine and with bodily temperature, and also with the bone marrow (which produces red corpuscles).



GLANDULAR BALANCE

(*Note.* "Plus" includes both enough and too much. The arrows point from the activating gland. No reverse effect and no three-gland co-operation is shown. A complete diagram would have many more arrows.)

Parathyroids.—These are concerned with the amount of calcium in the blood: their function is chiefly to store up energy. Plus activity may cause decrease in weight and in growth of bone.

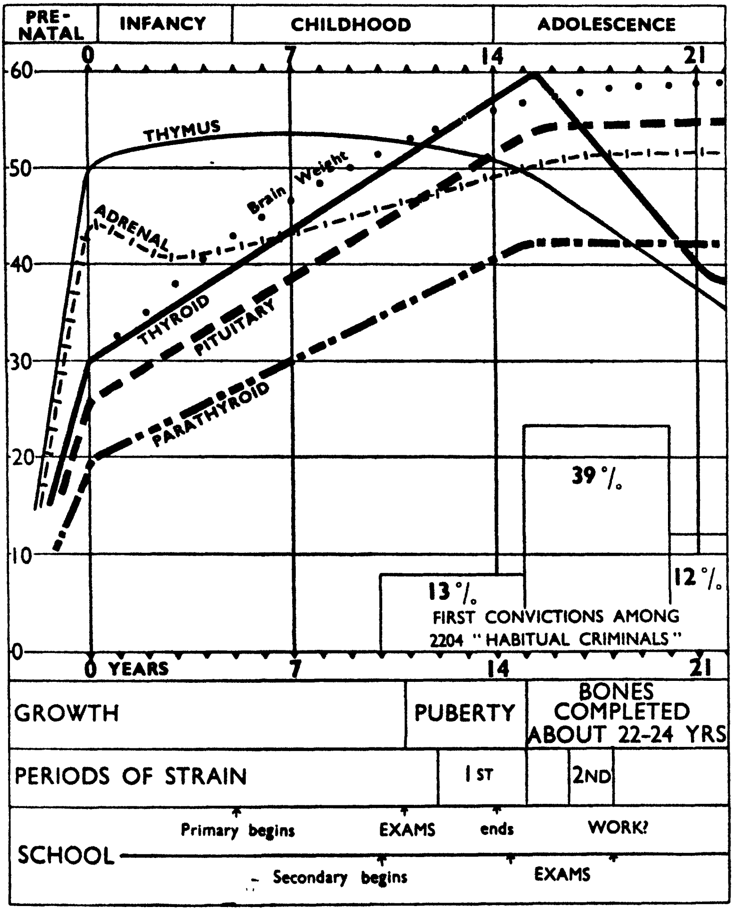
Adrenals.—These have an outer layer and an inner core.

Plus activity of the outer layer causes or is accompanied by early reproductive development. The inner core produces adrenaline, which assists the action of the more primitive (autonomic or self-governing) nerves on the muscles they control, raises blood pressure and slows the pulse. Emotion, fear, anger, pain, and physical exertion are said to cause plus adrenal activity.

Pancreas.—Its external secretion is poured into the digestive tube. Its internal product (from certain well-defined parts of the gland) is insulin. This is antagonized by adrenal, thyroid and pituitary secretions. Failure of this gland is connected with diabetes.

Reproductive Glands, or Gonads.—Their external secretions are concerned with making new life-forms. Some of the internal products lessen the activity of the pituitary and thymus; others influence such " secondary " sex characteristics as voice, growth of hair, deposit of fat, &c.

The bloodstream acts as a carrier for the products of the endocrine glands, delivering them from one to another as required, linking them up into a complex unity. It should be remembered that though gland A normally stimulates gland B, a reversed action appears to exist, by which any changes in or damage to B may cause changes in A. Broadly speaking, the endocrines may be divided into two groups, those which build up or store energy (e.g. parathyroids and some pancreas cells) and those which break down existing combinations and render energy available for use (e.g. adrenals, thyroid, pituitary). Or again, they may be classed as retarding or stimulating in their effect (e.g. the special combination which delays the ripening of the gonads until a certain stage of growth is reached, or that which tends to produce an unusual growth of bone). Their activity varies with age (e.g. the thymus increases in size during the first two years, is largest between 11 and 15, and lessens gradually through adult life). They are mainly controlled by the more primitive and self-regulating (or autonomic) nervous system, and voluntary or conscious nerve-messages should not affect their working. Yet indirectly conscious thought may seriously disturb them, the brain being made to claim



SOME GLANDS AND GROWTH

Chart of glands, adapted by permission from Dr. E. R. A. Cooper's *Human Endocrine Organs at Various Ages* (Oxford Medical Publications). Figures on the left show grades of activity — 60 very great, 50 marked, 40 mild, 30 beginning.

more than its fair share of energy and nourishment, so that too little remains for the purposes of growth. And once glandular balance has been disturbed, a discordant state of mind may exaggerate its inequalities. This bears directly on the arrangement of the daily time-table and the curriculum, which should vary with individual needs and be adjusted to individual powers. Unfortunately, these elementary demands are looked upon in most schools as slightly ridiculous.

The diagram of " Glands and Growth " combines a chart of normal gland activity at various ages (by Dr. Eugenia Cooper) with (*a*) a curve showing normal increase of brain-weight, (*b*) two rectangles giving the percentage of first convictions among 2204 habitual " criminals " (from *The English Convict*, by Dr. Charles Goring), (*c*) an indication of the strains of school life. The thymus curve reaches its maximum at about the age of 7, the thyroid curve after 15. The pituitary rises steadily to about 15 and then slows down. The parathyroid maximum is about 15. The disturbances of puberty occur at a stage where several gland lines cross, so does an adolescent crisis about the age of 17 +. The resemblance of the " crime " rectangles to the crossings of gland lines is striking. The stage of glandular readjustment about 14 recalls recent figures of juvenile delinquency. The educational strains indicated horizontally below the diagram could hardly fit the periods of interglandular change more successfully had they been expressly calculated for the purpose. It is difficult to decide who suffers most, the successful child or the one who fails and has to take the examination over again. Many cases of nervous instability date from or are made worse by these periods of living under forced draught. Some show fairly soon, others are postponed to later life when their consequences may be more serious and their cure less easy.

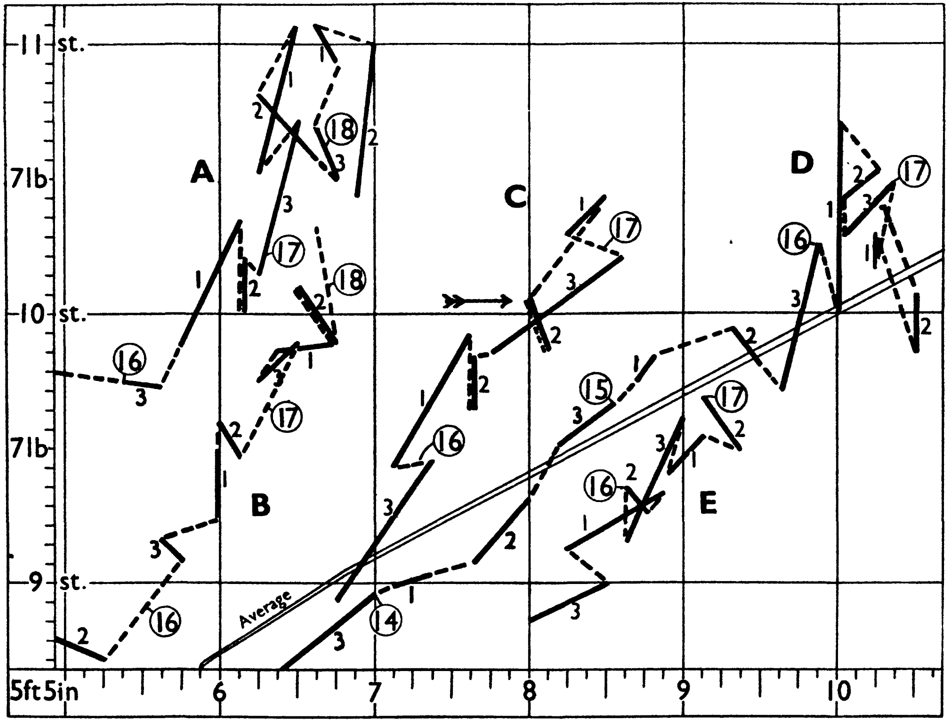
Disturbances of glandular balance are often accompanied by diffuse and vague feelings of discomfort, of general malaise. These may form a basis for a widespread irritability which seeks relief in an excess of action. Failing this, it may result in depression, fear, dissatisfaction, anger and the like, for which the environment sooner or later provides a focus. The steady stream of energy-expenditure changes into a series of jets and spurts, and the results of this disordered nerve-technique may range from silliness to sin. More than half the whole group of Dr. Charles Goring's habitual criminals fell over the edge into " crime " at or about the two best-known periods of instability during growth, at crises which we can predict but for which we do not prepare.

The processes of growth do not end until bone-growth finishes, i.e. about the age of 22 to 24, after which adult life may be said to begin. We are too apt to think of a child of 17 or so as almost a young man or a young woman. The " young persons " of commerce and industry, and the members of the upper forms of secondary schools are by no means the stable organisms we take them for. Difficulties of glandular adjustment are complicated by the increased strains which competition imposes on them. Records of height and weight taken at sufficiently close intervals show that the curve of growth is far from being a steady upward slope: indeed, it is often a bewildering zigzag. Unfortunately, such charts of the period between 14 and 18 are rather rare. The diagram of the " Second Growth Crisis " shows the height and weight and years of age of several normal youths, all of them " good ordinary ", " first eleven " people, well up to the best standard of physique in gymnastics and games, enjoying work and play and pursuing a reasonable progress toward manhood. The average curve of height-weight shown is that of 36 similar individuals living under the same conditions. The whole group is well above the normal town and country average of nutrition. The average-curve, as usual, wipes out all individuality. The figures in circles are years of age.

Each year shows three solid lines, 1, 2, 3, spring, summer and autumn terms: the dotted lines represent holidays. Consider the line of D. It shows his increase to have been fairly steady from 14 to 15½: after this it becomes an intricate series of variations, with gains and losses in height or weight. Contrary to the popular idea, losses in height are by no means uncommon. They occur in all these lines, and may be due to flattened insteps, to the usual distortions of the school desk, or to an inability to stand erect owing to general fatigue. The fully erect position is not always easy to obtain: it needs a fine co-ordination of muscles and nerves which is not always available. A daily loss of height from a.m. to p.m. is a commonplace, but this has been corrected by taking individual measurements as far as possible at the same time of day for each.

Not all charts of adolescent growth show these zigzags, but many do, enough to make it proper to regard them as normal to the school population, and evidence of a predicable period of instability for which allowance should be made. A period of rest lying down during school hours for day-children and boarders alike, for boys as well as girls, for new-entrants as well as leavers, would seem to be a reasonable precaution. But the claims of school life, the preparation for examinations, the enormous output of energy in games and sports as well as lessons, the additional demands on monitors and prefects and leaders, the approaching responsibilities of adult life and the uncertainty of employment, in short, the whirl of external stimuli amid which these young persons are expected to perfect an internal stability and a harmonious personality, may well prove hard to endure. The small arrow at the end of C's line marks the point at which circumstances suddenly provided a focus for all his discords, and—though he was on the very verge of successfully combining them into a harmony—he decided to end them by ending his life.

The growth lines on the diagram are those of secondary



HEIGHT AND WEIGHT IN SECOND GROWTH CRISIS

(*Note.* Dotted lines are holidays, solid lines are terms (1 Spring, 2 Summer, 3 Autumn). Years of age are in circles. Letters show individuals. Arrow marks C's death.

school boys living in an environment which would be regarded as far more satisfactory than that available to the ordinary run of children. It seems not unreasonable to suppose that records of other boys and girls of the same age, thrown into the labour market before the stage of puberty was ended, might show similar inequalities and irregularities of development. A system of education which takes no count of inevitable periods of inner strain during growth may do more than increase existing disabilities, may even produce new ones. Where vital energy is centred on a curriculum chosen not because it suits the individual but because it is necessary for the purposes of an examination, a division of interest arises which may result in discord. And though in many cases this may be overcome, in others it remains as a permanent source of weakness to be revealed later on under the stress of anxiety, ill-health, or sudden shock. The seeds of many a breakdown are sown at school. The study of growth and its crises may be most earnestly recommended as a field of research to parents, teachers, employers, magistrates and judges.

N/1999

CHAPTER VI

The Study of Movement

If, in the beginning, life had no form, and if later on its first shapes were changeable, with neither mouth nor food-tube—moving toward and surrounding its nourishment instead of swallowing it, we shall be safe in reckoning that movement comes earlier in evolution-order than digestion, and is perhaps even the very first sign or symptom of life. It is certainly ancient enough to deserve more serious study than it at present receives. Just as the science of language is wider than the teaching of languages, so the science of movement covers more than the teaching of movements—that specialized activity of the professional boxer, the football trainer, the dancing instructor or drill mistress, the doctor who learns the anatomy of the dead body rather than the kinesiology of the living, or the Blue whose coaching is more empiric than scientific. It includes the sprawling gait of the new-born calf, the absurdities of lambs, the antics of kittens, the fluidity of snakes, the dignity of a Pekinese, the deliberation of the tortoise, the incredible progress of the sea-horse, the penguin's solemnity and flashing swiftness, the speed of a mosquito's wing, the hawk's swoop, the rotund quiverings of aldermen, the mouthings of news-reel politicians and the gropings of a cradled child. Movement is not only of limbs or body: laughter is movement, and crying; speaking, eating, digesting; breathing, seeing, hearing, touching. By movement we show pleasure or pain, hate or love, pity, horror, scorn. The broken wing, the trailing leg, the palsied quivering of a hand, an idiot's smile, a nervous twitch, the confused violence of a fit, a snared hare's frenzy, the gasping of pneumonia, the fading pulse, the last drop of the jaw—these and a thousand more the student of movement must interpret if individual life is to be understood.

The naïve idea that a human being is divided into body and mind, that the two parts may be educated separately, that to work one is to rest the other, would be comic were it not so often the cause of tragic error. Writing and drawing, handicraft and the executive processes of art, the activities of the laboratory are all impossible without movement: its study reaches far beyond the gymnasium and the playing field; it extends to every room in the school. Athletics are concerned with quantity, so many feet or inches, so many yards per second: drill deals with the many rather than the one. In a gymnastic lesson apparatus can limit the range of action, simplify effort, localize its effect: in a remedial gymnasium structural damage can be treated and functional disorder resolved into harmony. But *gymnastikē* must make room for *mousikē*, now that the latter is concerned with examination results. Body must wait, brain is the thing that matters, and the vast majority of teachers—who know little of its structure and less of its functions—focus the energy of their classes on conscious thought, to the exclusion of far more fundamental needs. Rest and sleep and normal movement may go by the board, so that the school may win success. Out of this cloud of ignorance and pride the subject-teacher looks down upon the student of movement and growth and life.

We are all observers of movement: it is a skill which we share with other animals. Cats and dogs are learning to watch the traffic before crossing a road. Our own studies of movement begin in the cradle, where we watch it in others and feel it in ourselves: we employ our inherited power to acquire more by experiment. Later, our reliance on speech and writing blunts our movement-sense, but we still use it unconsciously. If we are to discover how and why a movement is made, and to estimate its correct value as an index of life of the individual who makes it, we shall need some scheme or order for arranging our data. First of all we shall have to define movement: we can then consider six aspects of it, its quality, quantity and range, the joint as a unit, the path of the parts moved and—last but not least—the appearance of the movement, so as to distinguish between what it seems to be and what it really is.

Definition.—A movement is a change of position of part of the body, due to muscular activity caused by a nerve-message, or to the force of gravity, or to both. (*Notes.* (i) A moving body may not be making movements, e.g. a fainting tripper falling off a pier into the sea. (ii) Movement, e.g. in a dance, may be composed of many movements, of arms, legs or neck. (iii) A movement due to gravity, e.g. when an arm drops because a group of muscles have ceased to contract, is here considered as one made by the individual.)

One or two simple cautions are necessary. (i) To move a part in one direction, a muscle receives a nerve-message or impulse: the order is nerve-message, contraction, movement. The nerve-message is the most important. (ii) To move a part in the opposite direction another muscle is used: do not think the first muscle expands and pushes the part back. (iii) Do not confuse bone-position with muscle action. An elbow may be bent not only by its flexors but by other means as well. First make sure what is happening, then find out how it happens.

Quality.—A movement may be quick, slow, jerky, ugly, graceful, &c. Its quality depends on the way in which nerve-cells discharge energy and on the path this follows so as to reach the muscle. The energy is sent not all at once, but in many separate impulses which add up till their effect is enough to make the muscle shorten itself. The discharge of energy from the cell may be called an "explosion": this may be weak or strong, too little, enough or more than enough. An individual who has made the habit of sending just the required amount may be said to have developed a good "nerve-technique". The type of "explosion" may be judged by the time the movement takes, e.g. *slow*, like a slow smile: *quick*, like a sneeze: *instant*, like the blink of eyelids. Some movements require an "explosion" like lighting paraffin in a saucer with a match—a very slow affair: others are like lighting gas, others like lighting petrol. (In movement, a second is a very long time.) Some movements are quick in one part and slow in another, e.g. a leap-frog, which has a quick beginning and end, and slows down in the middle. On a trapeze or a swing which goes forward and backward there is a time at each end when it is not moving at all, when you can catch it or let go: it swings in one plane and has a simple rhythm. Every movement has its proper rhythm, or lilt, on which its quality (and the quality of the nerve-message which causes it) depends. A movement may be *repeated*, like knocking at a door, or *recurring*, like hiccup. Each type of movement has its own type of nerve-cell explosion: indeed, the movement is an index to the condition or to the use of the nerve which causes it. By choosing a suitable type of movement a good nerve-technique may be built up or a poor one improved. Some movements require attention, e.g. those of the hands in building a house of cards: these are *conscious* movements. Others are *unconscious*, and require no attention, e.g. those of the stomach during digestion. Others may be either unconscious or conscious, e.g. the swing of the legs in walking, or in crossing a stream on stepping-stones—or, ordinary breathing, and the special breathing before diving to look for someone under water. In learning a new movement we should pass it through the conscious stage as soon as possible—by the third or fourth attempt, after which it should be felt, not thought. Quality changes when the conscious element enters into it, e.g. when a golfer thinks what a stroke ought to be instead of feeling what it is like. When we realize how movement-memories and movement-impulses pop in and out of our mental content, the idea that a human being can be divided into mind and body seems sillier than ever. Mind and movement on the other hand have much in common—naturally so, since patterns of movement and patterns of thought both result from nerve-habits, i.e. from nerve-technique. The quality of movement and quality of thought of an individual are more alike than is generally supposed.

Quantity.—Quantity of movement depends on the amount of energy or vitality available, and on the way in which it is used. Muscles have not only a power to contract; they have a certain contraction even when they are relaxed, rather like a piece of elastic which is still slightly on the stretch and would become shorter if it were cut. (The first slice across a leg of mutton, which opens as though a piece had been cut out, is an example.) This is called muscular tone: it is a kind of " resilience without effort " which the hands of those who practise massage come to know very well, and to interpret as a sign of vitality. It is very different from the tenseness of a muscle which is kept always slightly contracted, e.g. in a " nervous " or anxious person. The use of a muscle may be *active*, *passive*, *assisted* or *resisted*. *Active use* is when the appropriate nerve-cell (or group of cells) sends a message to the muscle, and the part changes position under the " owner's " own power. *Passive use* means that another person, a helper (or another object or force) supplies the power; the " owner " leaves everything to the " helper " and makes no effort to contract the muscle. *Assisted use* means that both owner and helper share in making the part change position, e.g. in bending an elbow. *Resisted use* occurs when the helper uses effort in the opposite way to that of the owner, e.g. in pulling against an elbow which is being bent. Quantity of movement also depends on the power of *localization*, i.e. of sending the nerve-message to just that muscle (or group) which is needed, and to no other. This means that unneeded muscles must be relaxed. A marked example of this is the looseness of limb which is typical of some negro dancing: contrasted with the tenseness and abruptness so often seen in gymnastic lessons or " drill ", it shows an entirely different nerve-technique. In one the available energy is used as and when required: in the other, a certain amount is wasted in contracting muscles which then have to be overcome before the movement can be made. Very few muscles cause one movement only; for instance, several can bend the elbow, but only one of them does nothing else—the others affect shoulder or hand or even finger-tips. They are " co-workers " in bending the elbow, but they have other jobs as well. Then there are the stretchers: benders and stretchers are " opposites ". To get the proper quantity with the least expense, co-workers may and opposites must be relaxed, or tuned out. *Relaxation*, " leaving alone " a muscle or group, is learnt at a very early age: later on many of us forget it, with extremely bad effects. It can be regained by practice—not by trying to do nothing, but by doing something, e.g. sitting with hands lightly crossed on your lap with palms upward. Not being able to relax is one of the worst results of modern life. Puppies and monkeys and young children and full-grown tigers do it beautifully: older children and adults should practise it at least once every day. A simple way of relaxing an arm is to pretend to " put it in the left-luggage office ", leave it, forget it, tune it out.

Range.—The range of a movement depends on joint-freedom, muscle-control and muscle-length. Each moving joint is made up of part of two bones, their special surfaces close together, bathed in suitable fluid, and enclosed in an air-free " envelope " or joint-capsule. If a joint is kept mostly (or a great deal) in one position the envelope shapes itself, or the bones may grow, to suit this, and the range of movement may be lessened. This often happens in the left elbow and shoulder of children or adults who have the desk-habit. Each joint should be moved fully each day if it is to keep its range. Its muscles should also know how to contract or relax properly—almost an impossible task for those who sit for six hours or more daily. Where a joint has a habit of a certain position, e.g. stays bent too long, the balance of its opposite muscles is altered—the benders grow too short and the stretchers too long. The range of its movement is thus reduced, since the shortened benders cannot yield far enough to allow of full stretching. School children, office workers, motor drivers, and many other employees, are often permanently restricted in range of movement.

The Joint.—Seen as a unit, the joint includes the parts which move and the muscles which move them. (The nerves which serve the muscles should also be added, but this would make a house-that-Jack-built which would be far too large for one chapter. It will be enough to remember that we are studying joint-movement as a sign of nerve-technique.) There are many kinds of joints, single and compound—many joint-shapes, hinge, ball-and-socket, saddle, universal. The elbow is a hinge, opening to 180° (a straight line) but not closing completely, and never turning. Thumbs and fingers have saddle joints, where one bone rides on another and moves backward and forward, as well as a little sideways. What we call the shoulder moves in two joints and has three bones. The shoulderblade-arm and the thigh-hip joints are ball-and-socket shapes. The "universal" movement of the wrist affects five finger, eight wrist, two arm bones, and twenty-seven joints in all. The muscles which move one bone on another may affect one joint or several: for instance, the long group of finger-benders start above the elbow, and some of them reach the finger-tips, passing across (and if necessary moving) some or all of the joints between. The starting-point of the muscle (where part of its material grows into a bone) is the one nearest the middle line of the body, and is called its origin: the other end is the insertion. In ordinary action the shortening muscle pulls the insertion nearer to the origin, e.g. the elbow-benders pull the lower arm towards the upper, as in lifting a cup or glass. But in getting on to a bus or tram the hand-grasp fixes the lower arm and the elbow-benders pull the upper arm towards the lower: this is reversed action, and the origin and insertion of the muscles are said to be reversed. (It will be seen later how this may affect the working of their nerves.) A few muscles start from a bone but finish among other muscles or near the skin, e.g. those which "cup" or hollow the palm of the hand: some people do not have these, and another muscle does the work. In either case the muscle or its substitute helps to bend the wrist. There is a whole set of muscles which are not attached to bones at all, but are arranged in rings or curves (as in the stomach or along the food-tube or veins or arteries). Though they do not move bones they change the position of parts of the body, i.e. they cause movement; but they differ from the "bone-muscles" in build and in nerve-supply, though they resemble them in nerve-technique. Their effect is more widespread and general, e.g. on the blood-supply (as in a blush), whilst the others have precise and particular work to do (as in pointing a finger).

The Path.—Since joints have definite shapes, and muscles pass from one fixed point to another, each movement has its own path. The simplest example is the hinge-joint of the elbow, out to a straight arm or line, back to an angle depending largely on the thickness of the arm. Since the elbow-angle in a straight arm is 180° we may call 90° half-way, or the "middle position" or centre of the movement-path. From this to straight-arm is the outer half, to fully-bent-arm the inner half. Movement in either half may be towards the centre or middle position (concentric) or away from it (excentric). Try to puzzle out which is which in raising a hat, or in opening a sliding door with the left or the right hand. The whole business is more complicated with a ball-and-socket joint such as the shoulder: here, with elbow straight, the hand can describe a circle in the air while the arm outlines a cone—the apex of which is at the shoulder-blade. At this stage, students of movement are apt to lose themselves in mathematics and mechanics instead of attending to the nerve-technique of which the movement is a symptom.

Appearances.—Having learnt the possibilities of every joint, its muscles and their nerves, the next thing to do is to train our eyes to observe movement accurately (a painstaking affair) and our reason to distinguish between what it looks like and what it really is. The outstretched quivering hand of a man selling matches in the street, for instance, is the palm upward or turned inward? Does it shake from wrist or elbow or shoulder? What about the other hand, as you pay your penny? Is the quiver on one side or both, genuine or imitated, due to injury or illness, or merely a result of hunger and cold? Or again, the irritating smile of the child you have rebuked before the whole class: is it due to shyness or conceit, or is it an attempt to rebuild and display the self-respect you have just damaged? Or forbearance, because she is right and you are in the wrong? And what movement can you make to improve things, or is your own nerve-technique at fault? In this connection a game with a kitten is instructive. Get it to play with your hand, quick fingers and flashing paws dodging each other till—on its back—its front feet clasp your wrist, and teeth or hind claws are bared. Pull your hand away, or even make it tense, and you will get what your deserve; but leave it still—not relaxing so much as tuning out its nerve-messages—and the kitten will wait, or get up, or look to see what is coming next. Movement responds more quickly and delicately to movement than to words. I have given a dog my wrist to hold in his mouth while, with the other hand and a foot, I opened the teeth of a trap which had caught a paw. Note, too, the difference of a hand stretched out with fingers bent, palm down or palm upward, and its effect (whether on animal or on human beings).

After injury to a joint or a muscle we prefer to avoid any movement which may cause pain; we hold the part still (e.g. an ankle or a finger) either by sending it no nerve-messages at all or by choosing those which will keep certain muscles contracted and maintain as comfortable a position as possible. In everyday language, we make a " muscular-nervous bandage " which is *protective*. Such a habit does not take long to establish itself, perhaps only a few minutes, but it may last a long time, even after the injury has been cured. Where the pain or shock has been serious enough, the nerves concerned may continue to conspire against and to prevent movements which structurally are quite possible. It is not that the person can not but that the limb does not move beyond the " threshold of pain ". By knowing how to combine the refused movement with others against which no protective habit has been made it is possible to help the person to get over the difficulty. If this is not done the habit may become a more or less permanent " pattern of movement ", or may disappear for a while and recur when the person becomes tired or ill, anxious or afraid. The old injury makes as it were a frame for the new trouble, becomes *pictorial*: the pattern of movement is linked up with a pattern of thought. In extreme cases the movement which once caused pain (and was prevented) is —when consciously made—accompanied by a memory of pain past, and may arouse a fear of pain to come. It requires absolute intellectual honesty if the person is to decide how much of the pain is of yesterday, to-day or to-morrow. It is a great mistake to put this sort of thing down to " imagination " or " hysteria " or " pretence ". A pain-memory habit is every bit as real as (and sometimes even more painful than) what we call a " real " pain. It is a nerve-pattern which has to be somehow or other recombined into a different design if it is to be abolished. Such patterns go to make up many of our fears.

It may be that a movement has been (consciously at first and then protectively) avoided for so long that it has been *forgotten*, and the inability to make it has become an accepted part of the owner's being, " my ankle ", " my stiff shoulder ", &c. Here persuasion is a waste of time; conscious effort defeats itself, since the movement is " known " to be impossible. Yet a good observer may catch a glimpse of it as an unconscious element in a totally different action, and must devise a way of stalking it without attracting attention. One plan is to try something so new as to seem unconnected with it, or something so old and habitual as to need neither effort nor active memory. It is surprising how many people who have forgotten or lost a certain arm-movement can use it, unbeknown, in the process of polishing a table or catching a ball. The choice of the moment to refer to it in words requires tact and skill, since it has to be consciously recognized as possible before it can take its old place in the owner's nerve-technique. The pattern of the movement has for a short time to form part of the pattern of thought, of the conscious mental content, in order to become once more an automatic, unconscious or involuntary action. This is another example of the connection between movement and mind.

Extra movements are very common. " The moving finger writes " and the moving lips and tongue go round and round; the brow is wrinkled in thinking, the hips wagged in walking. Some people keep their eyes still in the sockets and move the head from side to side when reading. Others blink or cough when they feel shy. Many stroke their face or " set " their hair or drum with their fingers: many more clench their fists and thrust them into their pockets and scowl. Some of these extras are due to self-consciousness, all of them are signs of a poor nerve-technique. A good place to watch them is in a restaurant as people advance rather than walk to their tables: perhaps the next best is in a class at "drill" or "physical training" standing to attention, where you may see almost every type of conscientiously confused contraction and an inhuman rigidity.

A *fixed* movement sounds a contradiction in terms, but it is a fairly good description of what happens when opposite muscles contract at the same time. Certain muscles lift (or shrug) the shoulder, others pull it down, some pull it forward, and others backward: if all work at the same time, all the movements they would cause cancel out. The shoulder-blade stays fixed, not because no nerve-messages are being sent, but because many are sent, e.g. when a firm shoulder joint is needed for some action of the arm. It is sometimes useful to fix a joint in this way, by contracting "opposite" muscles: if, however, because of some illness or accident, or a mistakenly sent nerve-message, two sets of muscles work against each other, a certain amount of fixed movement will occur. One set of opposites will win and one will lose this tug-of-war. The winners will do their work wastefully (because of the unnecessary resistance they have to overcome): the losers may never manage to cause any movement of the joint at all, and their owner and some observers may think they have lost the power to work. No little skill is needed to find some activity in which one of the groups is tuned out, so that the other can be studied alone.

It is not only in persons who have been ill or had an accident that fixed movements are found: the shock of seeing someone else damaged may bring about the muddling of nerve-messages which sets one muscle against another. Even in what would be called healthy people this kind of bad technique is only too common. Shoulders rise slowly as a person sits writing, pens are tightly gripped, frowns or sneers (partly "extra" and partly "fixed" movements) become a habit and are worn all the time: very often, muscles used in breathing are held tense—a most destructive thing and not easy to see from outside. A factor common to most of these errors is or has once been an anxiety or fear. The first step toward a cure is to relax everything: lie limp on the floor, and then make this or that single movement as lazily as possible. Be specially careful to begin with the face—eyelids not fast shut but just drooped and closed, cheek muscles slackened off, lips lightly touching each other, brow smooth. In quite active movements (balancing, vaulting, even climbing a rope) relaxation is helped by a quiet smile: this improves the quality of the nerve-messages beyond belief.

Patterned movements are arranged in a definite order and have a definite design of muscle and nerve use. In drinking soup from a spoon, the messages to eye, hand (and arm), lips and tongue are arranged in a certain order and follow certain paths: these have to be altered a little if instead of being at table you are sitting up in bed, and still more if you have to keep lying down. A very ordinary nerve-pattern is connected with using a latch-key, another with tying a bow tie. (Try tying one on someone else: from in front of the person the pattern is reversed, from behind it is the same as your own.) We have many patterns in common, and the little personal details we add to them, like breathing when soup-drinking, are signs of our self. To study their general nature, take *walking* down a moving staircase. We learned how to walk downstairs when we were small: the main alteration in the new pattern is the new rate of going down with the same old speed of our legs. The ceiling of the escalator-shaft comes towards us more quickly, but our eye-sensations and our leg-muscles and nerves soon get used to the new timing. To test this, find a tube station where one escalator is stopped except during rush-hours: walk on to the first flat stairs of the still staircase and notice what you feel in your knees as you come to the first step downwards. Because the ceiling comes at you more slowly than usual, the timing of your ordinary escalator-leg-muscle nerve-messages is altered, their pattern is changed.

This may give you some idea of the extent to which the activities of the nerve-cells in our brains and elsewhere are grouped in more or less standard designs. Notice how at first you have to pay conscious attention to the new leg-timing for the still escalator, and consider whether movement and thought are as different, as widely separated, as some educators and psychologists would have us believe.

Many movement patterns seem jerky, angular, abrupt and meaningless. Some of these " tics " may be due to illness, and not within our control. Others have grown out of habits which once had a use or meaning, and gave pleasure, protection or relief. These need careful study, which must be based on a detailed knowledge of ordinary healthy movement if it is to be successful. Quite often they are very like and sometimes they are connected with or even form part of those illogical processes which accompany disturbances of reason.

Movement and thought are definitely connected in mime. They are even more closely mingled in acting, where word and gesture assist or strengthen or even replace each other. But when we remember that without movement no expression of thought is possible (except by telepathy) we shall find it better to consider both as products of nerve-activity, and thus in their nature fundamentally the same. Those who cannot agree to this will at least admit that without an understanding of movement the fullest appreciation of thought is impossible. Though we may read a book, our impressions would be richer if we saw and heard the author.

Movement not only expresses thought, but may conceal or misrepresent or mislead it, as in the feint of a fencer or boxer, or the unusual flight or the cry of a plover trying to conceal the position of its nest. Absence of movement may serve the same purpose, as in the poker-face of a card or tennis player, or the pose of an opossum " playing dead ". These may be called *artificial* movements. They may be observed in the hard-working child who is reading a novel under the desk, in the too careless innocence of the cat who has just finished the cream, or in the plucky smile of an invalid in pain. They are never to be confused with the naturally limited movements of the injured or crippled; these have a different quality and technique.

Nerve-activity expresses itself in movement. Provided we know enough to allow for factors which may interfere with or affect it, it follows that we may consider movement as a valuable index to nerve-technique. And since life itself depends upon nerves (for if in part they cease to send their messages we become ill or paralysed, and if wholly we die), then " nerve-technique " is just another name for " way of living " or " mode of life ". Each of us has a certain available vitality at any given time, varying from hour to hour and day to day. Our nerve-technique varies with these variations. In dealing with another human being (whether in education or in industry) it is of the first importance to know the normal rate and extent of his or her variation. No one is ever quite the same: we are always changing. What we call constancy or reliability or steadiness is really a rhythm of change, a regular irregularity. We judge of people by their words and by their deeds: it would be better if we paid more attention to the way in which they use the one or the other. And since words (whether spoken or written) have their own special difficulty, shade of meaning, possibility of misunderstanding, we should often do better to pay more attention to movement in our endeavour to form an opinion of another being. The rather pitiable one-legged habit of judging worth by words, or ability by arithmetic, assessing individuality in terms of conscious mind alone, is responsible for much error. Study of movement is invaluable in helping us to distinguish between the defective child whose brain-substance is incomplete (or only partly developed) and the one with all its cells complete who through weakness, illness, shock or fear is imprisoned by the locking of its nerve-messages.

Movement may be a sign of happiness, disappointment, uncertainty, worry, satisfaction, despair or hope, of the countless moods which light up or darken the day. Those whose activities are limited to the stencilling of thought-patterns for examination purposes lose so very much: they miss the interplay of forces, the finer shades of meaning, the evidence of vitality to be seen in the turn of a hand or the carriage of a neck. They may even confuse fatigue with original sin. The study of movement has yet to find its proper place in education and re-education.

PART THREE

CHAPTER VII

Ordinary Children

What is " ordinary "? *Ordo* means a line or a row, of things or people. Books on a shelf, for example, all neatly arranged. The one which sticks out or is pushed in is beyond the line, extra-ordinary: all the others are ordinary. Ordinary means something which attracts no attention, but since this may be due to the attention quite as much as to the nature of the thing, it is no good as a definition. "Average" is equally unsatisfactory: an average of height and weight is something from which all individuality has been removed: it is an abstract thing. Whatever else an ordinary child may be it is not abstract. " Normal " is perhaps a better word, in spite of the semi-scientific and slipshod way in which it is so often used. *Norma* is the Latin word for the set-square which carpenters and masons use in making a right angle. A norm is a measure of rightness: a normal child is a right child. When we have made up our minds as to what a right child really is we shall be able to arrange children in rows. The extraordinary ones will be those who have something wrong with them, and the ordinary ones will be those who are right.

The norm, or right angle, is a fixed and standardized and unchanging thing: the normal child is never any of these. A living organism is always changing, never the same for a moment: it is never really still. When a child stands on a delicate weighing machine the indicator pulsates with every heart-beat. Asleep, the breathing muscles never stop work. Awake, the eyes and ears respond to countless messages from outside; the nerves receive, select and transmit; the cells of the brain vibrate in varying rhythm. When a living being ceases to change it is either ill or dying or dead. It is amongst these changes that normality is to be found, in the extent of the change and the rate at which it takes place.

What is right for one may not be right for another. There is a wide range of difference between the normal of individuals, yet always within the limits of health, of well-being. The amount of change and the rate at which it takes place may be pictured as a rising and falling line on a chart. During sleep there will be a gradual rise till morning, with perhaps a slope downward about three or four a.m. Each effort during the day, a lesson, a game, even a period of free time, will show a fall, followed by a valley which is broad or narrow according to the particular person's rate of recovery, with a hill on the other side of it which will mean the extent to which available energy has grown. The ups and downs of a right child will have much the same character from day to day during the week, with a fresh sort of contour for the week-ends. One chart will look wavy, another jagged, but the norm or measure for both will be the same, viz. the relation of the ups to the downs and vice versa, so much available energy, so much spent, so much recovery, and the time taken for the whole group of three. A rhythmic rise and fall will be a sign of rightness, an irregular series of changes may be an index to something wrong.

It is most important to remember that we are concerned not with a maximum or minimum but with an optimum, not with the greatness or smallness of what is done but with the style of doing it. We have first to find out what the child is like at its best. This we can do equally well by watching any of the four groups of nerve-activity, in eating or digesting or assimilating food, in any movement, in the carrying out a craft, or in the mode of thought. Whatever it is doing is an example of its nerve-technique and, if we know how to observe it, will give us information as to its rate of change. As with any other experiment or research, we have to exclude all possible sources of error, all factors but those we wish to study. It follows that the child must choose its own task, since if we choose it we introduce an extra factor, our own choice. However skilled we may be, however much we know (or think we know) of the child, our business is to observe not the way in which it responds to a stimulus from us but its manner of focussing its energies upon a purpose. The only way to exclude unnecessary factors is to watch it whilst it does something it wants to do, to allow it to choose its own work and do it in its own way. We shall then have a chance of seeing it under natural conditions, as a cameraman sees an eider-duck or a marmot or a wild deer in natural surroundings instead of in a cage at the zoo or a case in a museum.

The common objection to this is that the child will choose what it can do best, and that the result will be a false impression of its powers. Even if this were true it would not matter, since we are not judging results in one subject or its average ability in all subjects: we want to see it at its best. So long as the child makes the choice we have all we need for our experiment. But neither children nor adults always choose to do what they can do best: they choose what they prefer, which is quite a different thing. They choose it because they want to do it, and quite often they choose it not because they do it well but because they want to do it well. A further objection to self-chosen work is based on the feeling that it is not good for a child to have freedom of choice, since its after life will be full of things which it will have to do whether it likes them or not, so the sooner it learns to do what it is told the better. This of course is beside the mark. The method of giving a child graduated difficulties to overcome belongs to quite another experiment, the main factor in which is adult opinion as to the grade of difficulty suitable to a certain age. It is a kind of handicap, and we are not here concerned with pace when handicapped but with normal gait. The habit of giving tests and setting examinations makes it hard to remember the value of mere observation.

Nerve-technique is best studied under the four headings of living, moving, making and thinking. Freedom of choice in eating is naturally rather restricted, but it is useful to know the individual's favourite food or drink, e.g. its liking for or intolerance of sugar. The mode of eating is worth noting, happily or with pleasant talk, or hurriedly bolting a meal half-chewed, morosely or with excited conversation. Breathing, deep or shallow, costal or diaphragmatic; pulse, regular, intermittent, hurried or sluggish: complexion, flushed or pallid: perspiration, scanty or excessive, with palms or armpits wet or dry: excretion of liquids or solids, whether frequent, irregular, or scarce: the evolution of the powers of reproduction: all these have a bearing on the ups and downs of living. Any data as to length and depth of sleep are of course of great value.

The observation of movement is not confined to the gymnastic class or the playing field. Movement includes every activity which without movement would be impossible: seeing, hearing, talking, writing, drawing, playing the piano or violin, the practical work of the laboratory, and so on. A walk or run, an arm swung freely or held rigid, a smile or scowl: the list becomes long. The quick explosion of energy in a high jump, the dogged trot across country, the controlled carriage in a high balance, the abandon of a swinging jump with a long rope, are all of interest.

In making, we are concerned not with what a child makes but with its mode of making. Let it choose its own material, wood, copper, leather, silk, and make and carry out its own design: let it draw, paint, sketch, model at will. It is not for us to choose the shape its life shall take: our task is to watch that life as it flows into form.

Thinking is generally tested by question and answer, usually written. This may have a double drawback. The question limits and predetermines the answer, and to express the answer in writing introduces a very variable number of possible difficulties, in writing, spelling, phrasing, composition, and so on, each with its own artificialities and conventions. Remember that we are trying to watch natural activities. To catch sight of the quality and technique of thought we shall have to rely on speech: nothing else is fast enough, so nearly instantaneous, but even this is far too slow unless helped out by a gesture, an expression of face, a half-finished phrase. It is not always easy to follow even in imagination a nerve-message as it shapes itself among the association-paths of the brain into a thought.

It is as well to have some definite mode of classifying what we observe. A simple way is to decide whether the nerve-activity is slow, quick or dispersed. Slow and quick explain themselves: dispersed implies a message leaking over into or scattered among groups of cells not needed for the purpose in hand. For instance, a drawing child may raise its shoulders: a carving hand may be assisted by pursed lips; an anxious worker may contract opposing groups of muscles so that an arm or even the whole body becomes more and more fixed. Apparent slowness in expression may be the result of dispersion: each of the three types shades into the others, but for all practical purposes they are distinct enough to serve our end.

Out of the mass of ordered data arises gradually—not in one lesson, not in a day, but somewhere during the first half of the first term—a concept of the normal child: not an impersonal effigy of averageness, but a cinematic knowledge of the real John or Jane.

John.—Eight years old: home address often changed:

parents busy: bed-time irregular. Eats with no great pleasure, rather thin. Is growing faster in height than weight: parents both tall. Likes walking, but soon tires; feet very flat. When tired, is irritable or cross. Does not play much with other children. Has no skill in making things. Talks with interest of serious and grown-up matters, asks many questions, flits from this to that. Given creative opportunity and a place in which to work (i.e. to play) he is easy to handle, soon happy, soon tired, and—when he has learned to sprawl on a rug for ten minutes—quick in recovery, resilient.

With his type of nervous system and nerve-technique, temperament, it is normal for him to burn brightly, and to burn low, and then flame up again; normal for him to become oversensitive, first stimulated and then depressed by the products of fatigue. He needs help in " living " and " making ". One great advantage of " making " is that by choice of suitable material he can be helped to slow down the pace of other nerve-activities, to live not at the speed of conscious thought but at that of his craft.

Jane.—Just nine. Short and round and solid. Eats almost anything with success. Sleeps soundly and rarely dreams. Loves a game and knows all the rules. Efficient at crafts if and so long as she is told what to do and how to do it: will work happily for ever. A little slow at arithmetic, not poor at other subjects, and quite cheerful if her end-of-term reports are " fairly good ".

Her normal appears almost an average, nothing to attract attention, whether original work or original sin, except her interest in school plays. Has a good memory, and loves acting, though whatever part she takes she is always Jane. Otherwise not good, not bad: apparently just ordinary. No sudden ups and downs, no zigzags in her line, no deep valleys, or high hills: an undulating life, almost flat.

Five years later, years of activity and growth, John's ups and downs still have the same sort of rhythm, but the valleys are farther apart and there is a plateau between them. In other words, his energy lasts longer: there is the same quick drop into fatigue, though not quite so sudden: the valley is reasonably narrow and the slope up to recovery is full of promise. Besides being very good at History he has improved in movement and jumps and dives very well. He spends a great deal of time in studio and workshop, where his nerve-technique shows to advantage. Sudden and marked variations from normal have not occurred: they may do, but we shall meet them half-way. His normal rate of change is becoming stabilized. He is well on the road towards the ordinariness which for him is right. Because his activities are integrated he is equable in puberty.

Jane, just over fourteen, has been at home all last term. She eats very little, sits about listlessly, and looks very thin. Towards the end of the previous term she went off colour at games (" rather unaccountably ", her report said), became impatient, overbearing and unamiable. Craft work unsatisfactory, class subjects not so good as usual. " On the whole, Jane has disappointed me," wrote her form mistress. Her energies were mostly devoted to the school play, but after three weeks a bad cold with a slight temperature kept her away from rehearsals and another girl took her place. She was about again in time to see both dress rehearsal and the first of the two performances, but then relapsed and went back to bed. The cold was not thought enough to account for her condition. Her present lack of interest in things and persons is now being put down to some obscure psychic disturbance such as may accompany the stage of puberty, or to a form of hysteria, and the resources of home and school seem inadequate. Yet a more simple explanation of the facts may point the way to a cure.

John's regular irregularity attracted attention quite early in his school life, and was soon recognized as his normal variation-rate and a possible basis for stability. Jane, with her undulating existence, was regarded from the first as ordinary: no one expected her to be brilliant: original creative effort was not apparently in her line. Her one bright spot was acting, even though she always remained Jane whatever part she played. Her record seems to throw no light on the problem. Yet her rate of variation, so level and so undistinguished, coupled with her almost entire lack of creative activity, provides a solution. Where John could always find an outlet for his energies in thinking, Jane had no such channel for expression. For her it was easier to do as she was told than to try to find out what she wanted to do: she gradually lost her power of choice—a very dangerous form of atrophy. Her cold was accepted as just another ordinary thing: the usual attitude of school or home towards a cold is lamentably slack. A cold is always a symptom of a general nerve disturbance, and a cold with a temperature is a thing to take extremely seriously. Dimly aware of her own possibilities—as even the most unimpressive human being invariably is—and able to learn her part quickly because of her good memory; saying her lines over to herself in bed, hoping almost fiercely for a quick recovery; the discords of her conscious thought reacting upon those directly due to her "cold"; shut into herself by the lack of creative effort which had made her seem so ordinary; here are sufficient elements for a swift reaction. The return to work, the rehearsal, watching it (herself word-perfect) in the last hope for something to happen to her substitute, fused them into a capsule through which she finds it hard to break.

The remedy is simple, too simple to sound impressive. Somehow, someone must find something which she does really well, must help her to choose it for herself, must give her an opportunity to do it—even if only for a few minutes every day. An exercise in the gymnastic lesson, an important form duty, a piece of repetition, a chance to act an incident in a History or Literature lesson, some little suitable thing, but—soon. Delay in dealing with any form of repression is dangerous. Any activity in which she co-operated with someone else would be invaluable. The very worst would be to try to coax or to force her to eat, or to draw attention to her appetite in her hearing: it is already on the way to becoming part of a new character which she is playing to an interested audience. The approach lies through moving and making rather than through thinking: living can wait awhile. She might do worse than begin by making her own bed every morning.

In the popular sense of the word, there are no ordinary people. In the sense in which we have used it here, ordinary means normal and normal means right, right for themselves, stable in their rate of change, regular in their ups and downs, with a power of choice and with alternative creative activities in case of need. The phrase in the report " Jane has disappointed me " is illuminating. Why? Because her teacher had a preconceived idea of what Jane should be. It is possible that in actual fact she disappointed Jane. On the fly-leaf of a Mid-Victorian child's book was written:

> " This is John Smith his hand and pen.
> He will be good, but God knows when."

Not necessarily this year, or next year, but sometime. Not with any certainty at 11+, or by the end of the spring term. Standardized concepts of what a child ought to be at this or that age or stage of growth may be useful in grading the output of a system of mass production, but as aids to the study of life they are not only inadequate but misleading.

CHAPTER VIII

Different Children

Troublesome, naughty, dull, backward, retarded, " mental ", subnormal, abnormal, defective, imbecile, repressed, antisocial, perverted, extrovert, introvert, delinquent; these and other words make up a new jargon about an old subject —children with special needs. It assumes three things: the first, that these children annoy the adult; the second, that they fall below some accepted standard of behaviour; the third, that they have certain characteristics. The first deserves some sympathy: where classes are large or homes are small, and a certain amount of work has to be done in a certain time, anyone who gets in the way is apt to be a nuisance. This sort of word may be a good description, but it is a bad definition, since it states the observed in terms of the effect on the observer. " I do not love thee, Dr. Fell. The reason why I cannot tell." Dislike is often the result of ignorance. The second refers to some preconceived standard, and within certain limits is practical. It is quite safe to measure a piece of material in yards or inches, because the standard yard is a fixed invariable, and good rulers can be bought almost anywhere. " Antisocial ", however, is open to doubt as an accurate gauge. Society is a living organism and is always changing: also, on any given date it is different in Papua, Patagonia and Poland. Even in these islands it leaves much to be desired. Opposition to authority is not always a vice: it may be a virtue in disguise. The second type of word has some of the drawbacks of the first: its value as a definition is at least doubtful. The third assumption offers greater hopes of accuracy, but unfortunately it is rather technical, and expressed in words which are sometimes Latin, sometimes Greek, sometimes half one and half the other. Even when used by experts they should be taken with a pinch of salt, because the conditions they define are often matters of argument. In their search for a remedy for what is frequently a troublesome and distressing state of affairs, many earnest and quite well-meaning persons are attracted by the very accuracy of the new terms, and use them as confidently as they would a patent medicine, with as little knowledge of their content. Another source of error is a mistaken desire for tidiness: we are apt to think we have dealt with things because we have arranged them. Even more dangerous is our tendency to assume that we know a fact because we have given it a name: there is still a witchcraft in words. It is safer to avoid technical or scientific terms whenever possible. Stop, look, listen, and then say what we think in the simplest words we can find.

An ordinary child is one whose nerves take in, choose, and give out messages harmoniously: a different child is one who makes or suffers some discord in these activities. Nerve-messages may be classed as slow, quick, or dispersed—a simple grouping, but quite accurate enough to serve as a basis for a scheme of classifying what we see or hear or touch. For instance, Mary may be slow in answering a question. She may be thought "hard of hearing" (1) because of some trouble in her outer ear, (2) in her inner ear, (3) in the nerves from inner ear to the hearing centre in her brain, (4) in the nerve-cells of the hearing centre, (5) in those from there to the speech centre (including all those needed to choose the proper answer, e.g. she may be thinking of something else), (6) in those to the breathing or voice (throat or mouth) muscles, e.g. she may have a tendency to stammer. The trouble may be due to something in the actual material of her body (structure) or to the way in which she uses it (function). Albert may be especially annoying in the arithmetic lesson, because he knows he is not very good at it and finds a satisfaction in hindering others who are better. At a later stage his dissatisfaction may become so well organized that he is more aware of himself than of other people and is positively unkind: his well-being depends on the ill-being of someone else. His nervous energy is first repressed and then misused: his pleasure is another's pain. Ronald and Rose are always behind the rest of the class. (Behindhand is a more cheerful word than backward, or retarded: it suggests some hope of overtaking.) If only they did not need to hurry they would be much happier: in their anxiety they get their nerve-messages muddled, and say the silliest things. Abel hardly says anything at all: he just sits. He seems to hear and see quite well; he can take things in; whether he can choose and put them together is not so clear; certainly he cannot give much out. His nerve-messages rarely reach the surface: they may be dispersed or slow: they cancel each other out. He sometimes seems almost defective. (Such a nerve-lock is very common. In some cases it lasts only a few moments, in others it is longer or more frequent, and may become a habit. It may occur quite suddenly, as the result of a shock or fear or illness, at a very early age. Those who suffer from it may seem as though they were defective, though what they have is a paralysis of thought. Actually, they are prisoners, shut in and needing liberation for their nervous energy: this can often be found through movement.)

It is not difficult to carry out a simple form of research into the pace of nerve-activity. We soon form an idea of whether a person moves slowly or quickly or stiffly (or thinks quickly or in a muddled way), and with a little practice we can give a fairly reliable opinion. In a boarding school where the parents were not poor, and where the general surroundings or a lack of food or rest or sleep could be ruled out as not possible factors, 32 children, boys and girls, of various ages from 11 to 15, were selected as "not good at work ". Thirteen members of the Staff, representing a considerable number of subjects in the curriculum (art and music and various forms of crafts as well as gymnastics, mathematics, science and languages, &c.) volunteered to note their opinions of such of the 32 as came to their classes, describing them as slow, quick or dispersed in taking in, selecting and giving out (sensory, associative and motor

THE NERVE-TECHNIQUE OF 32 " BACKWARD " CHILDREN

Type of Activity	Persons	Per Cent
Slow	3	9
Quick	0	—
Dispersed	0	—
Slow, Dispersed	10	31
Quick, Dispersed	14	44
Slow, Quick	4	13
Slow, Quick, Dispersed	1	3
Total	32	100

activities). As might be expected there was considerable difference of opinion in regard to individuals—so much may depend on the effect of the subject or the teacher on the way in which a child works. Yet in only one case was a negative result reached and the individual described as slow and quick and dispersed, and even this may not have been negative at all, but positively accurate. Three were definitely slow, none were quick in all the activities studied, none were definitely thought dispersed. There were combinations of slow-quick, slow or quick and dispersed, and of all three. The figures (on p. 89) show the size of the various groups: details of the nerve-activity which was most restricted are not included. It is interesting to see that 19 out of the 32, or nearly 60 per cent, were considered quick in some respect.

The number of individuals studied is very small, but it must be remembered that they were studied as individuals, with no intention of proving anything about a number. There is no equal division of material among the observers: a teacher of music will not meet as many as a teacher of mathematics. Since not all are specialists, some teachers may meet some children in two or more subjects. In a boarding school, all thirteen observers would naturally see many of the observed out of class in free time, and in other ways. As far as the observers are concerned the important points are these. They know the children well and live with them for nine months in the year. They each have had special training in one direction or another: they understood what they were asked to observe. Their evidence may be taken as good. The opinion of the ordinary members of the Staff is of the first importance, since they are up to date in their information. They are on the spot. They have a perspective of experience of the individuals in question which no outside specialist or expert can hope to obtain, for the simple reason that he or she has not lived with the child, does not see it in its natural surroundings, and as a rule has to start the inquiry *de novo*, and depend largely on second-hand information. This particular type of study has several advantages. It helps the observers to understand the material and to state its nature simply and clearly. By disclosing individual powers it throws light on individual needs. In the light of such results, the Staff can alter the technique of their teaching and experiment with new methods: two or three especially concerned can work together. In a school where time and space are available the curriculum can be altered to suit the individual or the time-table changed.

That nearly 60 per cent of a group of "backward" children should be found to have an element of quickness, and that 44 per cent should be thought to have no element of slowness, would seem to point to a need for a new word to describe their condition. "Backward" has come to mean an inability to go forward, or at least a great difficulty in doing so. It is easier to decide that this is probably due to some chance of birth; not of course a failure of some part of the brain to develop, or its complete absence, but an inborn sluggishness which cannot really be improved. Some such belief is necessary if the conscience of parent or teacher is to be brought to acquiesce in the conditions which make large classes a necessity and individual help practically impossible. But, on a walking tour, someone may go slowly because he cannot go faster, another because she is carrying a burden. Looking more closely at this factor of quickness, we see that though it may be and usually is an advantage it may at times be a disadvantage. Many nerve-messages occur at the same moment: if those to my mouth are quicker than those to my hand, I may be quite good at oral answers and apparently dispersed at composition, leaving out several words of writing so as to keep pace with my thoughts—an associative speed and a motor lag. Or again, suppose a nerve-technique to be dispersed in character, with a tendency to a motor-nerve muddling of messages. Instead of going only to the muscles needed for driving a pen, some may be sent to other groups of muscles. The shoulder may rise, the arm be stiffened, the hand contracted, the fingers clenching the pen. Writing grows quivery and shaky, and takes longer and longer, and the writer may be classed as slow, or even as careless. Muscular and nervous mistakes are often confused with moral obliquity. Or again, neither slow-quick nor slow-quick-dispersed are contradictory. The imaginary chart of energy-expenditure in Chap. VII showed ups and downs, hills and valleys. Slow may well be a long drag up a hill of recovery, followed by a quick spurt at the top and a drop of fatigue. Slow-quick-dispersed may mean the same uphill drag, the same spurt followed by a drop into a rather broader valley where energies are hard to collect and to focus on the work in hand. These fluctuations are ordinary, they are right for the particular individual: they should be studied, allowed for, and gradually reshaped by adapting the environment and the technique of teaching. Some quick children need to be taught quickly if they are not to become dispersed. I have known an extreme case in which I had to talk faster than any shorthand writer could have taken down my words, for perhaps a minute or a minute and a half: no more was possible, the child's up changed into a down, and the long progress across the valley of recovery began, the lesson was ended.

Very frequently, the type of nerve-activity is the result of a past discomfort or discord which may be difficult or even impossible to trace. It is very doubtful if the attempt to discover it is always useful or even desirable. On general principles it is safer to leave it at any rate for a time, and to go forward instead of looking back. It is by no means always necessary to complete a history before beginning a treatment: we should never think of inquiring how a collision happened before extracting the driver from the overturned car and rendering first aid. It is too often forgotten that the curative agent is ultimately the child itself (or for that matter the adult, where one is concerned). There is much that can be done at once. First of all, make sure that the child is happy and contented: the simplest way of doing this is to give it a chance of doing something it likes. On no account refer to its worries and troubles: talk about something pleasant, or, sometimes better still, do not talk at all. Sooner or later it will make some remark about the work in hand, or one that can be led in that direction. Have some work of your own: it may help you to keep your hands from giving those delicate little touches to the child's work which are intended to be so encouraging and so helpful, and which in reality are so destructive of originality and independence. When directly asked for, these can be reduced to a minimum or very tactfully refused. It is tempting to give support to a wavering balance, to alter a line in a drawing, to supply a short cut in a calculation, to suggest a phrase in an essay, but you have to draw a very clear line between assistance and interference. It is often very hard to keep from touching the ark. To keep a wild bird in your hand you must open your fingers.

So long as a child is at its best, the work it is doing is immaterial, but should never be allowed to drag on into boredom or fatigue, or be put aside in a pet. Your purpose is to make sure of an optimum output and an excellent nerve-technique, as an approach even if only for five minutes to a state of content or happiness, which means internal harmony. If any time is left over, turn to something else the child likes doing, not as a bribe but as the simplest way of avoiding unnecessary factors in your experiment. Quite soon it will begin to look forward to its "lessons" with you. With confidence in your ability to help, confidence in itself will grow: this means self-control and self-respect. It may even tell you some of its worries.

Nerve-cells combine to produce their effect, whether this be a movement, or a simple class-activity such as writing from dictation, or a piece of original thought. During the activity they "tune in" to each other and their messages follow a more or less well-defined series of paths. These form a set of patterns, habits, some very useful because they save energy and fresh conscious thought, e.g. in walking. It would be exhausting to have to think out and learn how to make each step day by day throughout the whole of life: we learn it once for all, and though we may forget it during an illness the pattern is still there and may fairly easily be recalled. Some are apparently meaningless, e.g. a habit of sniffing, though once it may have had a reason. Other habits, less visible or audible, e.g. a fear, may have an equally definite nerve-pattern behind them. Patterns of thought lie at the back of such things as a shudder at the passing roar of a petrol engine after a motor-cycle accident, or a hesitation or unwillingness to open a letter with a well-known postmark or handwriting on the envelope because of a former worry connected with the writer or the place. Patterns of movement and of thought in a given individual not only have a similarity of design: they tend to influence the nerve-technique as a whole. A very valuable field of research is to be found in the redesigning of movement-patterns with a view to recombining patterns of thought. Apart from the indirect improvement in nerve-technique which can be obtained, the individual's ability to tune out certain groups of nerve-cells and to tune in others for the purposes of movement may be extended to the nerve-groups connected with thought. This has nothing whatever to do with suggestion or psychiatry: it is a simple piece of nerve-education which can be begun in the remedial gymnasium and continued throughout the rest of the school premises, and which forms an essential part of the re-education of "different" children. Not only does it help those with unsatisfactory thought-patterns to reshape them and recombine them into more appropriate forms of activity: it has a direct bearing on the preventive aspect of teaching. The formation of new nerve-patterns by a child whose available stock of them is small will keep it from losing still more of its already narrow range of choice and dropping farther and farther behind. But it is in the creative work of education that the power to adapt the pattern designs of thought and action to the needs of the moment, and to imagine entirely new ones, is seen at its full value. It is the mainspring of adaptability and versatility, and of the co-operative and creative effort of which we are so urgently in need. Unhappily, our present system aims chiefly at producing standardized results. This is due in the main to a combination of inspection, industrialism, and the examination system. To backward children, who more even than those who are ordinary need daily chances of original and self-chosen effort, the results are disastrous.

In teaching a subject, one is apt to become intrigued by the knowledge to be conveyed, and to devise all sorts of clever quips and twists as aids to memory and short-cuts to learning. The subject is more important than the child. Gender rhymes for Latin and nonsense rhymes for History and Logic are quite amusing as exhibitions of a special skill, but they have little or nothing to do with wisdom. In teaching children rather than subjects, especially those who are behindhand, the important thing is the individual. Essays, exercises in geometry or gymnastics, experiments in a laboratory, scores in a game—these are mere by-products. What really matters is what happens in the worker whilst at work. Instead of a crystallization of energy it should be a stage in evolution.

CHAPTER IX

Useful Facts

Any fact about a subject may be useful: it all depends upon its relation to other facts. Willie sprains his ankle—a pity, since a fortnight in bed spoils his holidays. His cousin sprains his ankle, and is unable to play for the school in an important match—a disappointment to everyone. His housemaster sprains his ankle: his fortnight in bed saves him from a nervous breakdown and his house from an outbreak of nervous insubordination—a crowning mercy, as Cromwell used to say. It all depends. By all means get as many facts as you can: one of them may be important, like a needle in a bottle of hay, or a lighted match under a leaking carburettor. An attack of indigestion, for instance: it may only mean that Ellen has been at the apples again: it may be the earliest recorded disturbance when Albert was eight months old, a sickness followed by convulsions, which recurred once or twice a year until he was fourteen. As you collect your facts select the ones you want to keep—especially those you do not quite understand. Avoid becoming a snapper up of unconsidered trifles: some earnest students of the child become almost kleptomaniac. When collected, keep them in some sort of order, instead of pushing them into the belfry like a jackdaw. Facts in a heap are useless.

An ordered record of the main events in a child's life may be infinitely useful: I have known cases in which the lack of it resulted in a conviction, and one that ended in sudden death. There may be an illness, a trouble of some kind, an unexpected change of growth, an approaching strain such as sports or examinations may cause: information is needed and should be available at once. Such a record should be kept up to date, never more than a week behind the times. It may never be asked for, but if it is it may be wanted urgently. When John or Jane passes out of school to further education in another place, an enormous amount of time and trouble and risk could be saved if the main facts of their previous history were available to the new set of people responsible for them. As it is, everyone has to start almost all over again. Unfortunately, there is a risk either way. Suppose a child passes from nursery school to school certificate examination, its record growing as it goes, some fourteen years of its life set down on paper. A serious movement has already begun with a view to using such records in cases of delinquency. It will not be long before they are needed when applying for a post: employers fully realize the value of a healthy staff. The next stage, if some reformers have their way, will be to make the record a condition of marriage. The ultimate slavery is reached when the State requires a sound history during education as a condition of citizenship. That this is no exaggeration, no imaginary risk, may be seen from what has already happened in at least two Continental countries. Rather than embark upon a piece of work which can be so misused, so perverted from its original purpose of helping the individual, it would be better to muddle along as we do to-day. There is, however, an alternative. During school life the record should be private, accessible only to parents and head teacher, and with their approval to form master or mistress, gymnastic teacher or director of physical education, and, when necessary, to the school or home doctor. It will at times include details which are not for general discussion in the Staff common-room, intimate things concerned with physique or family life. Once the reason for this privacy is understood there need be no fear of an abuse of confidence. Though not bound by a formal etiquette, teachers have sufficient common sense and common decency to respect a convention upon which the success of their work depends. During the last term of the last year at school, in the case of those who leave between thirteen and fourteen, the record should be handed to the parents. In secondary schools it should become the personal property of the child, to be taken out of the school files by it, when leaving. No extracts from the record for the purposes of school statistics should be made without the permission of the parents and, in the secondary school, of the child as well. This would prevent the use of the record by the employer or by the State for purposes which are contrary to the traditions of a free country.

The first record is the life chart, from birth onwards. It is useful to know whether Joey was born prematurely or at full term, his weight at birth, how he was fed, and so on, with any circumstances which might have made his prenatal existence more difficult. One child whose progress I was able to watch for four years had been a seven-months baby weighing 3½ lb.: he was very behindhand in some ways when he came to school, but gradually overtook the others and became ordinary during the first year or two after leaving. Home addresses are useful: frequent changes may be disturbing. A child who moved from south-east England to the south-west found it hard to get used to the climate. Another, with less than a third of normal vision, had lived in the same house all his life: this was an advantage, since he knew his way about so well that his lack of sight was less troublesome. In another case, where the district was unsuitable and the journey to school too long, a change of address would have been good. The distance of home from school may be important, especially if it is just near enough to make it possible to go home at midday, yet just too far for comfort and health. A boy who lived a mile away walked over twenty miles a week getting to and from his school work: another cycled or went by bus fifty miles a week, two and a half each way. Add these figures to games and gymnastics and they make a considerable burden. Measles, scarlet fever, influenza, heat-stroke, a shock or an accident, a common cold with a temperature, are useful facts to know: they may fit in with a move to a higher class, a new subject to learn, or an approaching examination. Many other pieces of information may prove worth recording.

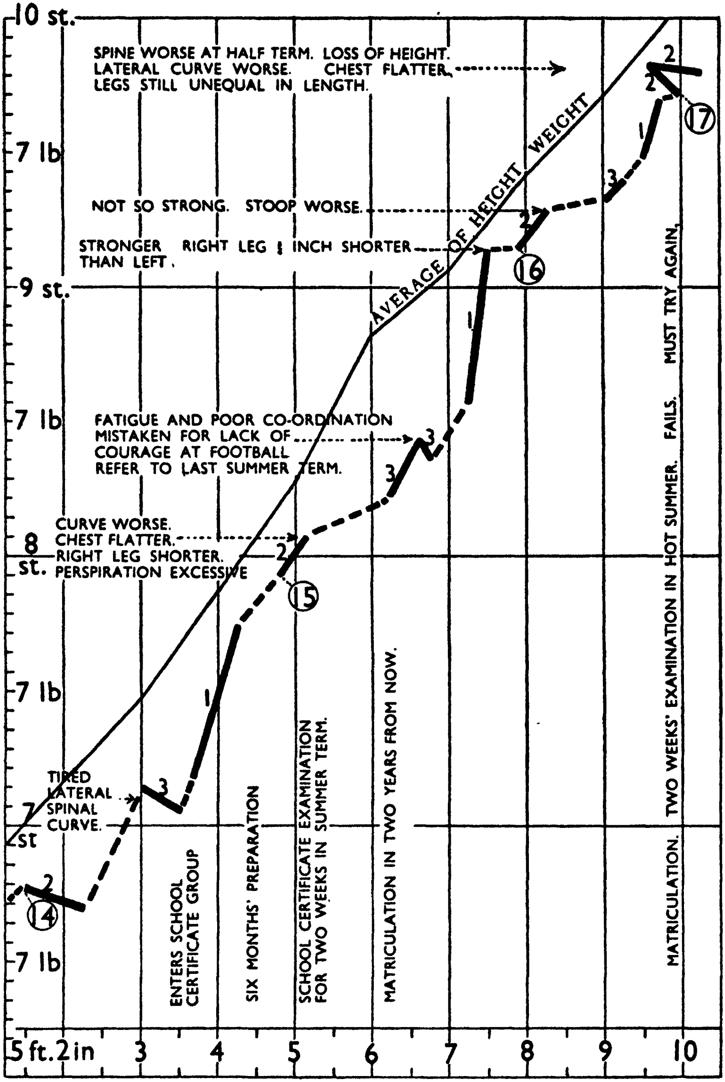
However scrupulously these are written down in a book, it is hard to remember them all as one turns from page to page. A bird's-eye view of them is better. This can be got by using a long sheet of paper. Chronologically arranged, the very arranging sometimes shows up a possible period of strain, which may have had an effect upon the child's development, and may indicate the way in which the load of to-day may be altered or reduced in the interests of to-morrow. Parents remember facts in a rather irregular way: "when he was three and a half", "that was in 1927", "we were living at . . ." Along the top of the life chart are two scales, one in calendar years, one in life years, placed so that birthdays come at the proper part of the year. As the facts are remembered, they are put down in the proper horizontal column under the proper date. A few words will be enough: if more are needed, a number can be entered and a note written on a separate sheet. It is best to let the parents take the chart away for a week: memory is slow and fitful. They should make their entries in pencil, so as to be able to alter them easily if put in the wrong place. The teacher of gymnastics is the best person to take charge of the work, and special time should be allowed for it. Even though he or she may have no examinations for which to prepare a class, this is a long job, and cannot be done in a hurry. It is best not to attempt a life chart for each child in the school all at once, unless it is a very small school: begin with a dozen or so children with special needs, and add to the number as new ones come

HOW TO ARRANGE A LIFE CHART

<table>
<tr><td>Name</td><td>Calendar Years</td><td>1928</td><td>1929</td><td>1930</td></tr>
<tr><td>Born on 30th April, 1928</td><td>Life Years 0</td><td>1</td><td>2</td><td></td></tr>
<tr><td rowspan="4">Prenatal life
Birth. Full term?
Assisted?
Length of labour
Breathing
Moving
Noticing Sight
Sound
Sitting
Crawling
Standing
Walking
Speaking</td><td>Schools, or Teachers</td><td></td><td></td><td></td></tr>
<tr><td>Home Address</td><td></td><td></td><td></td></tr>
<tr><td>Sickness, or Accident, or Shock</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Any other facts</td></tr>
<tr><td colspan="5">Remarks</td></tr>
</table>

each term. A separate folder will be needed for each individual. Squared paper showing tenths of an inch is the most practical, one-tenth of an inch for a month. Changes of school come first, because they are few, easy to fill in, and give good practice in putting entries in the proper place. All this may seem too fussy and too much bother, but the following extracts from such a chart may show how useful the work may be to parents and teachers and to the child. Games mistress, hockey: " Ada should try not to avoid the ball." Form mistress, general report: " Her work has not been so good: she seems slow and at times inattentive." Both these are from the spring term. In the summer an eye specialist writes: " She has been groping in a half-dark world." (Ada had cataract.)

The second record is a chart of growth. Measurements of height and weight are taken at the beginning and end of each term, care being taken that the individual is measured at the same time of day on each occasion and in the same clothes. Thin knickers or shorts are practical. In extreme cases the clothes should be weighed and the amount subtracted before entering the figures. When it is realized that a cupful of water may weigh six to eight ounces, the need for keeping to the same time of day will be obvious. A pound or more may be lost during a game, or even in the course of an interesting or difficult lesson. Weight " in clothes " is unreliable and not useful: thicker underclothes in winter, and the contents of the pockets at any time of the year cause misleading results. Since the relation of height to weight is an index of glandular balance or unbalance it is best to be as accurate as possible. I always measure to the nearest ounce, and test the height twice; the second test is often the more accurate. The weighing machine should work by levers, not by springs: the latter vary with temperature and are apt to tire. If comparison of the individual is made with the average growth curve, a margin of 7 per cent above and below average weight is compatible



A CHART OF GROWTH AND WORK

(*Note.* Dotted lines are holidays, solid lines are terms (1 Spring, 2 Summer, 3 Autumn). Years of age are in circles.)

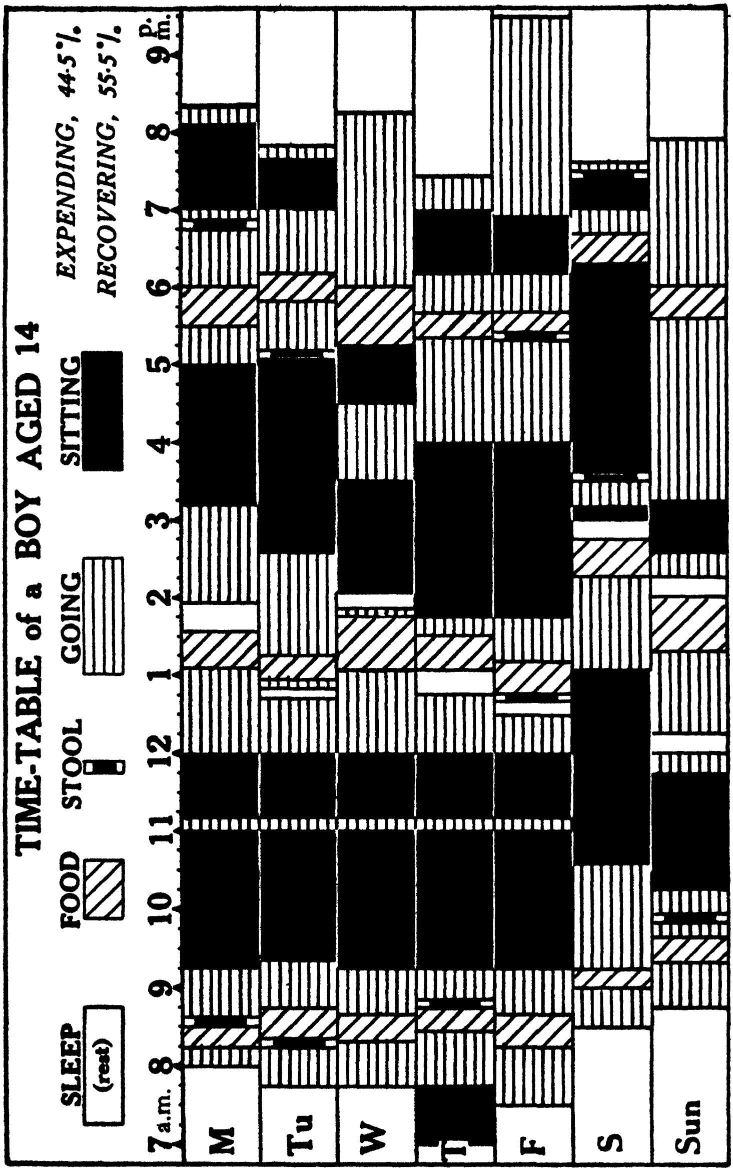
with health: some authorities say 10 or more per cent for the upper limit. The solid lines are the terms in numerical order, 1 spring, 2 summer, 3 autumn: the dotted lines are holidays. Since such a chart includes only two sets of facts (height and weight), age has to be added—in this case at the beginning of the summer term: the numbers in circles are birthdays. By drawing rectangles with a birthday at one corner a quick guess can be made at the amount of yearly growth. On, or better still, below the growth line useful facts can be entered, such as changes in any of the four groups of nerve-activity.

It would be easy to find an extremely variable line, but it will be more convincing to choose that of an ordinary person, good at both games and work, and showing a regular rhythm of change. Each year loops itself along the average line, with a drop towards the winter term which may have been due to keenness on football or may have been caused by overexertion during the summer: the latter seems more probable, since the gain in weight in the spring term is good. Summer fatigue, with its factors of stimulating weather, games, sports, swimming, the summer-time dislocation of sleep, and the yearly rush of examinations for internal or external purposes (moves in form, certificates or scholarships), may last well into the autumn and affect the epidemics of the spring. The excessive perspiration noted after the end of the fifteenth year (a slow dropping of moisture from under the armpits) is very often a sign of nervous fatigue. The changes in chest and spine at the same period should be taken in connection with the note about work, preparation for examinations. They occur again before matriculation. The record half-way through the summer term after seventeen shows a loss in height, due to prolonged sitting, regained by special exercises and extra rest in the last fortnight of term. This and the other symptoms would most probably occur again before the next examination.

The third record is the time-table: this should cover twenty-four hours a day and include a whole week. Timetables usually describe morning and afternoon school, and nothing more. But there is homework, and the journey to school, and free time, and many another way of occupying oneself: also, every activity spends energy, and this has to be regained or remade. Each up is followed by a down, and ups and downs together make a rhythm if they are properly arranged. To recreate energy we need food and rest and sleep: we spend it in both work and play. The usual idea of resting the body by working the mind and vice versa neglects the fact that both movement and thought use up energy. A game may be as tiring as a lesson, and a lesson which is very dull or very interesting may be as tiring as a game. Free time, with some children, can be exhausting. Standing at a bench in the workshop or the laboratory may be more tiring than sitting in a desk in class. Sitting down for hours every day has its own ill results. At first sight there seems to be no simple way of comparing expenditure and recovery of energy. But if we remember that most children put most of their available energy into work and play for most of the day, we can make a reasonably accurate statement of the amount of time given to spending energy and to recovery. There is a broad difference between going from place to place and sitting still. Sitting will include all classwork (and homework) except workshop and gymnastics or physical exercise. Going will include the last two and games, which may be called "controlled going": it also covers free play, the journey to and from school, getting up in the morning, and so on. From the point of view of energy spent, all activities are taken as equal; no difference is made between playing games and playing about, or between one subject of study and another. Alternation between activities is considered as stimulating and refreshing rather than resting: it serves to provide a means of getting rid of the products of fatigue, not of building up more energy.

Using paper squared in tenths of an inch, take one-tenth for every five minutes horizontally: vertically, take from five to ten tenths (ten makes a good proportion) for each day of the week. Using coloured pencils, mark the times of getting up and of going to bed in green. The completed chart would form a cylinder, like that on a barometer, green covering the whole night: it is enough to show an hour or so of sleep before getting up and after getting into bed. All food times are in red, 20 minutes for breakfast, 30 for midday meal, 40 or so for the evening meal. Going is yellow, controlled going a darker yellow or orange. Sitting is black. Take Monday as the first day of the week: the relief of Saturday and Sunday's change can then be studied together. The time-table for the week can be kept by the individual, with help at home and school. It is to be just a diary in colour, accurately kept, with the clear understanding that there is no fault-finding connected with it, but only finding out: this is important. There is to be no trickery about bed-times. For some years now I have made a custom of asking the child to put down the times of emptying the bowels: I find this is always taken for granted as a reasonable request, and the information is often invaluable. The first time-table is that of a boy of 14, the second that of a girl of 16½ during the week immediately before matriculation. The various colours of the original tables are shown in shading. The useful fact in each is the ratio of food-sleep to going-sitting: whether the fraction is satisfactory depends on the individual. Both of these are unsatisfactory.

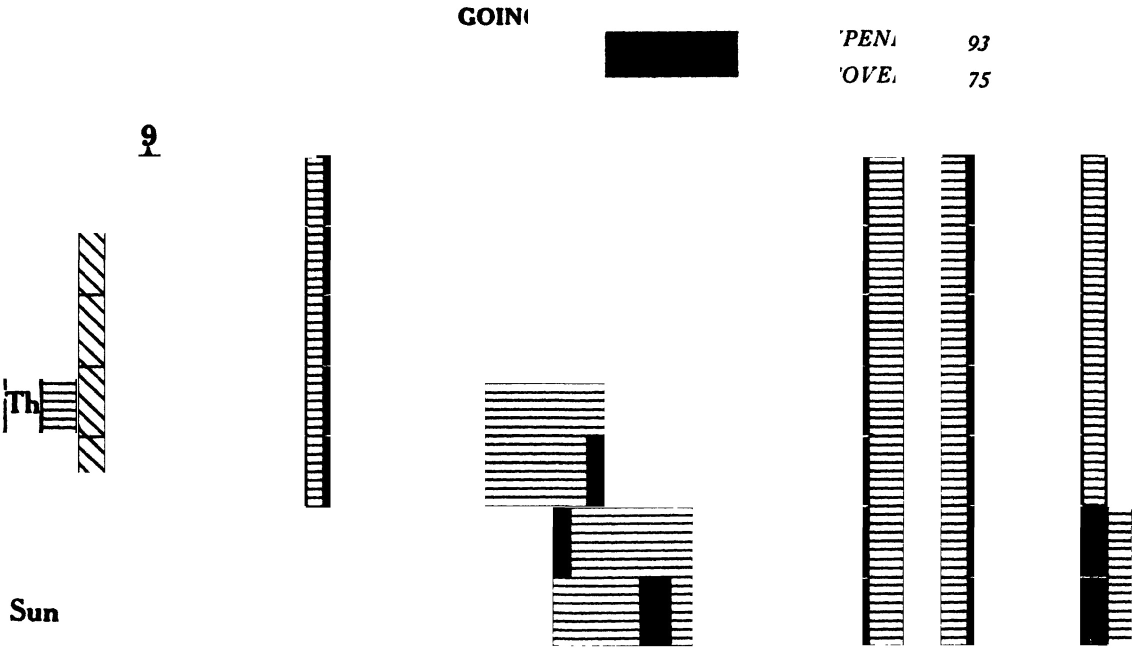
The small boy came to me with the usual report of troublesomeness, naughtiness, laziness, bad work, lack of interest, indiscipline: if no improvement appeared before the end of term he would be asked to leave school as being unfitted for a secondary education. His life chart showed the progress of a delicate sensitiveness made irritable by chronic fatigue; a tendency to digestive disturbances, and


TIME-TABLE of a BOY AGED 14
SLEEP (rest)
FOOD
STOOL
GOING
SITTING
EXPENDING, 44·5%.
RECOVERING, 55·5%.
7 a.m.
8
9
10
11
12
1
2
3
4
5
6
7
8
9 p.m.
M
Tu
W
T
F
S
Sun

a depression owing to a knowledge of the falling off in his work. Unable to attract attention by good results, he tried to do so by noisiness and sillinesses of every sort. His time-table shows too much " going ": a mile to school twenty-two times a week, plus games (played badly, and usually a cause of rebuke) and gymnastics, was more than he could afford. Changing over to lunch at school gave him nearly an hour to spare, and saved him eleven miles a week: after it, he was allowed to go to the gymnasium, take a mat and lie down to rest or read. Punishment was dropped for the rest of the term. Creative effort in the studio was encouraged: he chose to model animals and birds. He paid careful attention to regular excretion, tried to stop dawdling over dressing in the mornings, and to work at his best for short periods of each lesson. Result: third in his form at the end of term, with good reports. Note that he was at the period of puberty. The changes in the rhythm of his life at home and school aimed at a regular sequence of ups and downs, of expenditure and recovery of energy, and at opportunities every day for self-chosen creative effort as a means of improving his nerve-technique. These he found in the gymnasium and the studio, i.e. in moving and making; later he improved his thinking.

The girl's time-table is an almost perfect example of the absurd demands made upon examination candidates. Bus and train journey across a crowded town, concentrated effort in classes taught by specialists who were proud of their pupil and abetted her strenuous efforts, games well played, special treatment for her spine, which overwork had permanently distorted, but no attempt to reduce the number of hours spent in sitting, and an ignorance on the part of the staff of this otherwise excellent school of the effects of such a time-table on a growing organism. Their follies in this case were made less harmful by an unusually sensible home, but this cannot always be guaranteed. It is time we realized the wastefulness of burning out a growing organism.

.GED 16 ONE BEF((CULATION



There is an increasing tendency to regard children with special needs as somehow beyond the power of the school to improve. Teachers are too busy teaching subjects to have time for children. The extraordinary body is sent to the doctor, the extraordinary mind to the psychologist, neither of whom is in a position to effect a twenty-four hour a day treatment, except in an institution. Yet this is precisely what the school and the home together can do, and do well. Between them they have all the data, and can arrange them in a life chart. Progress in height and weight goes on under their eyes. Together they can try to readjust the load of each day, and to provide occasions for rest and for creative effort. They see the child in its natural surroundings, amongst its friends and equals. To send it to a special building for special lessons from a specialist is to make it a specimen in a laboratory, to increase a self-awareness which is already beyond the normal. To deal with individual needs is the work of the school. Child guidance is education, the common task of every teacher, but made more difficult because of lack of space and time, and because of the false ideal which confuses knowledge with wisdom and lessons with learning. The size of the class and the standardized results it must produce by a definite date are directly responsible for many individual discords, and make the cure of many others impossible. Meanwhile the theory gains ground that they are caused by some strange factor which can only be dealt with by an expert in psychology or medicine, and that the teacher is somehow unfitted for the task: the child with special needs must be sent to the clinic. The school should be the clinic, and would be—but for sheer numbers: this is the bitter truth. The nation which tolerates overcrowded classes, the younger the larger, will get the education it deserves, and pay for it in dissatisfaction, disability and discordant nerve-activity, with its consequence—disease.

PART FOUR

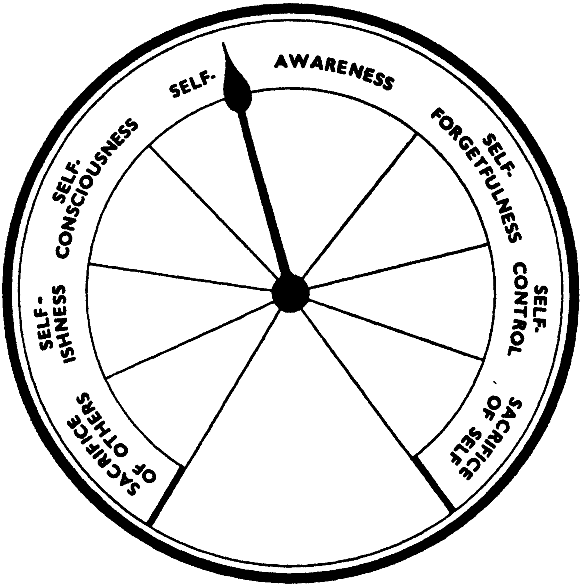
CHAPTER X

Self

Living beings are always changing, never quite the same from morning to night, day to day, season to season. They have to keep a balance between two forces, one tending to pull them apart (as a stone in a sling is whirled away from a centre) and the other holding them together (as gravity pulls an apple toward the earth). Their balance is never steady: it shifts as the forces vary, and sways like a " candlestick " on a see-saw. The energy which their cells give out is never discharged in a constant stream, but in a series of jets and spurts. Yet though they are always changing they do so in a more or less regular way, which we come to recognize as their own particular habit of life: we know roughly what to expect. We say of a person recovering from an illness, or improving after a spell of bad work, " He is more like his old self ", " Richard's himself again ", that is to say, he has got back to his usual rate of change, to the ups and downs of the life-curve we know so well, to the self which he knows more intimately than we can ever do.

Some of the activities which make up our self escape our notice, e.g. those of digestion. Others demand some of our attention, whilst some of it is focussed on what we are doing. For instance, in making a shot at goal in football, though we are aware of our body-movements, our change of weight on to the proper foot, we notice the other players and we have a quick look at the goal-mouth. Others again thrust themselves on our notice so that we have little chance of thinking of anything else, e.g. a throbbing nerve in a tooth, or a painful corn on a toe which hurts at every step. We vary in awareness. Sitting at work on a translation, or solving a problem in mathematics, our self sinks out of sight for a while, only to bob up again above the surface with a foot which has "gone to sleep", or an aching spine, or eyes which insist on having a rest. Self-awareness flickers between wide limits of vagueness before taking definite shape. It may be compared to the period marked "Change" on a barometer, in which the weather is neither good nor bad.

From time to time the changes become more marked: for one reason or another they attract either our attention or that of other people. A tickling throat at a concert makes us hold our breath: we become conscious of our self. A cough (more noticeable than it need have been because it was repressed), and we become conscious that others are conscious of us, and we grow even more self-conscious. It need not be something in us which started the whole vicious circle: anything connected with us will do. Mother takes Elizabeth (aged 4) to the cinema, and her shrill small voice keeps asking "What are they doing now?" People turn round, or laugh, or call out "Hush!". Mother becomes self-conscious and takes it out of Elizabeth. Some self-conscious people slink about the world in a vain attempt to avoid attracting attention: others, unsure of themselves, swagger round and seem to be showing off, a habit which is apt to end in becoming a source of satisfaction, balancing the dissatisfaction they first felt. Self-consciousness, shyness, swagger, shame have much in common. On the barometer of self they give warning that the glass is falling and that bad weather may be on the way. On the opposite side of the dial is self-forgetfulness: quite literally, self is forgotten; not by any special effort or because of some greater interest or enthusiasm. When nerves are harmoniously at work, and energy is being given off rhythmically and is well focussed on a definite purpose, there is no reason for us to be self-aware. It is as though we were on a journey and had labelled self "not wanted on the voyage": the question of self does not arise. Self-forgetfulness may slide over into absent-mindedness; but when this makes us take no notice of the traffic, or becomes a habit of paying no attention to other people, it begins to be a slight form of illness. It may also be found to have an element of self-consciousness and even of selfishness: if so, it belongs to the other side of the barometer.



THE BAROMETER OF SELF

Self-consciousness, an exaggerated self-awareness, may last only a few moments, or may become chronic. Sooner or later it may develop into a definite selfishness. As this happens it crystallizes into one or both of two forms, a passive state of extreme shyness into which the individual gradually retires and finally becomes imprisoned, or an active condition in which self is asserted at the expense of others. From its earliest stages this is to be regarded as a serious discord, and every care should be taken by the patient and by relatives and friends and teachers to counteract it and to secure a quick and complete recovery. Just as neglect of a cold may lead to a grave illness with dangerous consequences, so the disregard of selfishness may be responsible for results which last a lifetime. The original cause is not a moral lapse, but the standardization of a nerve-pattern: the remedy is to recombine it in other forms before a change in its design becomes impossible. This applies equally to the passive and retiring type, which may well have begun in nothing more complicated than a general weakness, a circulatory failure, or a widespread and chronic fatigue. In either case, treatment should aim at focussing available vitality upon a self-chosen purpose, even if only for a few minutes at a time.

Though distressing in the extreme to those who are unable to prevent the gradual change from self-consciousness to inactivity, its consequences fall mainly on the sufferer. The active form of selfishness, on the other hand, seeks relief and escape in belittling or in causing discomfort to others, until in time they scarcely attract one's own conscious notice. At first it may amount merely to self-assertion at their expense, but gradually the repressed energy is misdirected and perverted. The natural enjoyment of creative effort sours into the unnatural pleasure of destruction. The final stages are easy to understand: it is as though self stood so close before the eyes that to see anyone or anything else was impossible. An almost perfect selfishness is the most striking symptom in crimes of passion, cruelties, and the more calculated forms of murder. In terms of weather, the bottom has fallen out of the glass:

typhoon has come. Even in these extreme examples the mode of treatment remains the same—the redesign of nerve-patterns, the re-establishment of a normal self-awareness.

On the opposite side of the barometer of self, forgetfulness passes into self-control, a normal condition of well-being in which the ups and downs of nervous energy balance each other. Out of this may grow self-sacrifice, an equally normal human or animal activity, with no special ethical content. A cat will go back into a burning house to fetch a kitten, or a passer-by to find a baby: a woman jumps into a canal to save a drowning youth: an unemployed man goes down a sewer to help someone who is gassed. To the well-balanced human being such sacrifice of self seems quite ordinary, all in the day's work, if indeed it be ever considered. The saying that self-preservation is a law of nature is only half a truth: self-sacrifice is equally natural. Indeed, the question of self does not arise, except in cases where personality swings from selfishness to self-control. In some of us the barometer is far from steady at either set fair or rain. There is nothing unusual in sudden changes from one mood to another: many children can be kind and unkind to others during the same day. These variations may be regular or irregular: they should be compared with other ups and downs of energy, which may point the way to the discovery of a common cause. Such sudden instabilities may be due to unsatisfactory excretion of waste products of various kinds, to irritability or oversensitiveness, to a narrow margin of available energy; or they may be signs of a widespread disorder in nerve-technique. I have known a well-defined selfishness become literally menacing during an attack of indigestion or the after-effects of a chill.

It is not always easy to decide whether what appears to be selfishness may not be a virtue and what seems like unselfishness a vice. In order to make the best contribution to the community, an individual may have to withdraw for a time from co-operative effort. This is true of much creative work, concentration on which may be mistaken for self-centred interest and even for self-importance. On the other hand, an eagerness to help others and a constant occupation with their affairs may hide a very real inability to focus energy upon one's own activities, and may end by lessening the value of what we do for others. One of the unavoidable results of a day's teaching is that the constant division of the teacher's self among the many members of the class, and the ceaseless adaptation to so many widely different needs, brings about a very real disintegration of personality from which it takes some time to recover. The more individualized the work of the class and the more conscientious the teacher, the more difficult the recovery. Mistaken enthusiasm, and ignorance of the real nature of the condition, may lead one to actual pride in this exhaustion of self. It is easy to mistake busyness for business, but beyond a certain point such self-sacrifice is of very doubtful value as an example to the young. Doing good to others has its dangers: the golden mean is so to live that what we do to others must be good.

The "barometer of self" is just a pattern of thought, deceptive if taken too literally. There are no hard-and-fast lines between the various grades and stages of change. Its simplicity is attractive, but it would be dangerous if it tempted anyone to try to force a symptom of selfishness or of any other of the groups into its ordered neatness. It is no fool-proof device for testing character, or calculating a spiritual quotient. It aims at no moral teaching. It is, however, a serious attempt to examine the causes and growth of a baffling condition, which neither rebuke nor an appeal to a better nature can always be relied upon to improve. The almost instinctive dislike and distrust of selfishness which human beings feel is proof that it has in it something against nature, something ill. To judge the extent of the illness one must first have a clear idea of what one means by well. If a child is happy I know that on the whole its nerves are harmonious: when I am told it is selfish I know that somewhere there must be a discord. The changes in self-awareness are natural to a state of well-being: what changes might cause an unnatural condition of ill-being? Starting from here, and stating the problem in terms of nervous activity, one finds that the barometer almost arranges itself; the various stages from ill to well fall into place. Used carefully, and with the reasoned doubt which should temper all intelligence, it has made me realize that both self-sacrifice and selfishness develop out of self-awareness, that they represent changes in a single condition, that they are not opposites but relatives. It has helped me to a better understanding of a symptom which I feel to be distasteful and know to be dangerous. We are told that to understand is to forgive: it may be even more useful if it helps us to devise a cure.

CHAPTER XI

Fear

The units which make up the nervous system consist of a cell and its projecting fibres or fibrils: they receive and send messages. Under ordinary conditions these messages travel in one direction, along a receiving fibril toward the main body of the cell, and away from it along the sending fibre or axone. A nerve-cell is thus a one-way street. When no message is being dealt with, we may think of the material of the cell as having a fairly constant wave-length, the one most suited to the circumstances, and typical of the individual. When a message is to be received, the cell will change its wave-length as required, and adapt or tune itself to its task. When this is over, a pause for recovery will be needed, and afterwards it will return to its original wave-length so as to be ready to deal with further messages. Its power of returning within a reasonable time to a satisfactory wave-length, its rate of recovery, will be a sign of its internal harmony or stability. The power of receiving and sending a particular message implies a power of refusing others, of tuning them out. The actual amount of energy needed must be very small; the cells themselves are very tiny; their activities require a very delicate sensitiveness, yet within reasonable limits their stability is of a very high order.

The unconscious regular messages which have to do with digestion, breathing and the many other activities of living, and the more conscious ones which are connected with moving, making and thinking, combine to make those ups and downs of energy-expenditure and recovery which are typical of each individual. Within limits, even abrupt changes in this personal rhythm do no harm: they may cause pain or pleasure, yet the general design or curve of life remains the same. But sudden or violent variations may cause a shock, and the nerves may be seriously affected. The normal wave-length of the cells may be altered and their rate of recovery between messages slowed up: their power of sending messages may be reduced, or in some cases destroyed: it may be that the direction of the one-way street may be reversed. Cells especially concerned at the moment, or for one reason or another especially liable to disturbance, may remain for a long time very sensitive to the sort of message which caused the trouble.

The ordinary person is said to breathe about sixteen times a minute: a heart is said to beat about eighty times a minute. Some people have a pulse-rate of seventy or even less: others breathe more slowly. Taking a breathing rate of sixteen and a pulse-rate of eighty, lungs and heart will have an activity-relation of sixteen and eighty a minute, or one to five. Sitting down might slow both of them: running upstairs would quicken them: playing tennis might make breathing very difficult and the heart-beat very fast. Yet in all this there would be no real discomfort, no distress. If the heart beats twice as fast the breathing rate increases, and both keep a reasonable relationship. But try to catch a train you know you cannot catch but simply have to, or get up in the night to run for a doctor, or struggle to swim against a tide, and the harmony of heart and lungs is gone. Nerve-messages are irregular or too weak, the pause between heart-beats or breaths gets shorter and shorter, energy is overspent or misdirected: instead of harmony you have discord and the beginning of disintegration. Anxiety grows into distress, and distress may change to fear.

A fear is not a single trouble, such as a broken bone. It may have had a single cause, but in itself it contains a whole collection of consequences. One person is afraid to go home in the dark: why? Another is afraid of bulldogs: why? Another cannot stand mice, or spiders, or lightning, or anything which crawls, or certain people, or certain illnesses. There is a particular distress, but there is also a general discomfort, and both settle down round one object. A bulldog, for instance: uncertainty in dealing with animals, tales of obstinacy, of never letting go, a fierce-looking jaw and a strange way of breathing: all sorts of mixed ideas go to make up a picture of the animal, which in reality is pathetically gentle and well-meaning and kind and faithful. It is not bulldogs of which we are afraid, not this particular bulldog we fear: we have a fear of what we think or feel or half-remember about bulldogs, a rather dreadful and inaccurate muddle of emotions and errors. Or again, a grown-up person is afraid of diving because once as a child a dive was unpleasantly high, or deep, or flat. Here a very definite and accurate memory from the past is pushed into the present, regardless of one's increased strength and skill in movement: it is a pattern of nerve-activity into which we force the facts, unreasonably and inaccurately. Absolutely accurate honesty of thought may be a very useful antidote to fear; sometimes, but not always. Other groups of nerves besides those concerned with thinking may be affected.

Take a very simple instance in an animal, in whom thought is not so complicated as in a human being: a lizard on a gravel path in the sun. Walking on the grass, my feet make no noise: as I put one foot on the path my shadow falls over the lizard, which suddenly becomes aware of noise and dark. For a fraction of a second it is still: then its body muscles contract with speed and force: it empties stomach, bowels and bladder: then it disappears under a bush like a flash. Any living thing which has to run will do so better if it is empty than if it is full: in such conditions almost any animal will empty itself as much as possible. The nerves controlling this are those concerned with living; they act unconsciously, but very purposefully. There is nothing to prove that the lizard was afraid, but only that it was preparing to run. Not only would the nerves to its excretory muscles send messages: those to its adrenal glands would become active: whole groups of nerves would be linked together with those which sent messages of noise and dark. It may have had a shock: it need not have had a fear. But, another time, noise or sudden shadow might cause the same linking-up; it would then have a fear, and having a fear it would be afraid. These digestive and other disturbances are common to human beings as well as to animals. In small children they actually work: I have known a child aged one who was actively sick when he first saw a typewriting machine. In older people, the long habit of repressing the action of bladder or bowels until a convenient time makes this symptom of fright less obvious, but it still remains, as many of us know, as a nerve discomfort. It may be that these effects of fright or anxiety or shock upon the nerves which work involuntarily make reason alone an uncertain cure of fear. However this may be, it is a fact that movement often gives relief to those who are afraid.

I have found an improvement in nerve-technique in moving a very useful means of helping a person to redesign those nerve-patterns of living and of thinking which have come to represent a definite and particular dread. It is the fashion nowadays to deal with these through thought, either conscious or unconscious, going back over the years with patient care and attention to detail, bringing hidden things out into the light, explaining, suggesting, day after day and month after month in search of some original cause—a painstaking and often painful method, sometimes successful, always expensive (since time means money).

In this method great stress is laid on the need for confidence in the specialist; without this, good progress is not expected. With movement as a medium in which to work, the whole scene is changed. Confidence in oneself is the first, immediate essential. Instead of the past, we are in the present, with the teacher's mind upon the future. Instead of something to think about or remember, we have something to do. Instead of thought, which is invisible and complex, we have movement, which is visible and simple. Instead of the vague muddle of memories which is a fear, we have a definite focussing of energy upon an act. As teacher and taught together find ways of cutting out all unnecessary muscular contractions, i.e. nerve-messages, nerve-technique grows better. The habit of choosing carefully among countless nerve-activities is re-created: the design of nerve-patterns is simplified. Accurate movement and accurate thought require the same accurate, honest, scholarly use of nerves. Since there is only one nerve-technique for all the nerve-activities of any given person, the discarding of hurry, muddle, error, and anxiety in the way of moving means the same improvement in the way of thinking. First, calm; next, purpose; next, action; and always, simplicity.

Another direct advantage of movement as a medium, which in thought can at best be indirect, is its effect on those unconscious activities of which the lizard gave such good examples. Everyone knows that to stand upside down long enough will overfill the blood-vessels in neck and face and brain, or that to stand up straight and still for long enough will make one feel faint. Between these two extremes, a skilled use of movement can send the blood to head or legs or abdomen or arms—can use these nerves or leave out those—choose the quality of nerve-message needed or alter its strength—change the rate of breathing or pulse—cause perspiration—improve the tone not only of the outer abdominal muscles but also of those of the intestines which deal with excretion: all this with purpose and intent, and with a happy effort by the individual concerned. And, as self-confidence increases (often by leaps and bounds), the particular design of movement which frames the fear can be broken up, gradually, indirectly, and in time even consciously—the final step toward self-control. This conscious stage is often very short: only a few moments, and the movement drops back into its original place among habits learned in or near the cradle, a re-grouped nerve-pattern, too natural and obvious to arouse attention or call for remark—just ordinary, normal, right. As self-control grows, other anxieties and fears may be remembered, and information about them asked for by their " owner ": in this way the risk of self-consciousness is reduced. At most there will be a heightened self-awareness, with no thought of blame or shame, but only a growing certainty of re-creation. The method has its advantages: it is a pity it is so little understood.

Fear always has in it something of romance, of the thrill one gets in cinema or theatre, the pleasure of playing pirates or Red Indians, the risk of walking under a ladder, or the fate which falls on those who see a new moon through glass. As designs, these pictures lack conviction: the scribbles we make on the walls of our mind are rarely better than our scrawls on a telephone pad whilst waiting for a call. It is often rather fun to draw bogies or scarecrows. But, when we let them incorporate a fear, our private worries may become public nuisances, annoying to our relatives and dangerous to our neighbours. At times they may even be responsible for war.

There is no disgrace in being afraid. It is no more shameful to have a fear than to have a cold. It is not the being afraid that matters, but what we do when we are afraid. Pretending that only children have these discords, adults have invented a grown-up code of bravery which is really a code of cowardice: they are afraid of showing they are afraid. In the winter of 1917 a boy who had been waiting nearly two years for the time when he must enlist said to me, " I think grown-up people have somehow failed to understand fear." Two years on the edge of a precipice of horror! What a relief it would be to many little people if they knew that almost all big people sometimes felt small! We ought no more to think of leaving a child (or an adult) with an unresolved fear than we should of leaving it with a dislocated knee. In either case the sooner we deal with the trouble the better. The difficulty is to know what to do: there is no set procedure, no rule of thumb. One person may have many fears, and one fear may take many forms, so that its owner's mind may be like a barn full of bats on a dark night. A simple way of clearing it would be to put a light outside. It is rather worse than useless to say " There's nothing to be afraid of" when there obviously is. The only suggestion I would make is that if you have to tune someone else's set you had better tune your own first. The four instances which follow are not intended to show what to do, but merely to show what I did and how I did it when confronted with someone else's urgent need.

(1) A delicate-looking fair-haired boy of six years old, on a hillside with his parents, some miles from home, watching an R.A.F. display. A droning sky, the thud of bombs, the roar of vertically rising planes. The boy begins to gasp, to sob, to call out, " Take me home, oh, take me ho-o-me!" Caught up in his chanting misery he begins to scream. Walking slowly towards him so that he sees me, I put a small Pekinese dog down at his feet and say very distinctly and quite quietly, "Would you like to come with me to the dog's house, and bring mummy and daddy? It's quite close." He looks at the dog, at me, at his parents, says, " Oh—please—come," and begins to run, but I get him to push his wheeled chair along the path and we go more slowly. Before we reach the house (in less than two minutes) he is talking reasonably about the people who

live with the dog—though he is careful to shut the garden gate so that the planes will not come in.

Remarks.—The gasping and sobbing are both discords of breathing, and of the heart-lung relationship. As the phrase " Take me home " becomes a standardized wail he begins to be shut into himself (the barometer of self dropping rapidly): his conscious control is being drowned in waves of emotion: his distress is becoming organized into a fear, a nerve-pattern which may remain as a memory. His parents cannot stop him crying: he is beyond their reach, almost beyond himself: a stranger's touch may make things worse. But a charming golden little dog against a green background of grass will at least take his eyes off the sky: he looks at it, and stops wailing for a moment; there is time for simple words to pierce his self-centredness. His breathing changes as he speaks. His chair provides him something to do, a release for his pent-up motor energies, a rhythmic action instead of a frightened run. The first approach was made through sight, the next through sound and conscious thought, the next through movement. The main object was to integrate his disintegrating self, to re-create the normal rhythm of his ups and downs. It may seem as though too much is made of small details; but, where all may be won or lost in the first few seconds, no detail of manner, movement, expression, tone of voice, is unimportant. His cure was finished as he took his chair and walked.

(2) A girl of 16, tall for her age, thin, dark, outlined against the closed door of my class-room, three minutes late, afraid to go in: standing quite still, one hand to her lips, the other raised toward the handle she dare not turn: a statue of negation. (Her movements in games and gymnastics are usually rather quick and jerky, impulsive, but lacking in control: soon tired. Works happily at crafts, but slowly and sometimes clumsily. In my Latin class slow and very shy: says she has no memory: can take in and send nerve-messages quickly, but is poor in selecting: often seems to

stop work entirely—a good example of a nerve-lock.) Had I been in time for my class I should never have seen this picture of dull misery. As we sat outside the room and talked she explained how stupid and slow she was, could never remember things. I asked her name; she told me: asked her to say "Three blind mice"; she said it all: asked her to say "God Save the King", and she replied: "Don't be silly; of course I can remember that sort of thing." "Then you have a memory," I said; "what worries you about my Latin class?" "I get things wrong, and they sound silly, and then people laugh." Her picture-frame for all her worries was her bad memory, which was really a good one. Classwork became a constant dread, in several subjects, to be escaped by lateness or "forgetting", and going to the school library or elsewhere to occupy herself in self-chosen effort. She had begun to grow a reputation for unreliability. I told her that for three weeks she could come as late as ever she liked, and promised I would not ask her a single question; when she felt ready she could ask me one, just anything, so as to get used to the sound of her voice and to other people hearing it. She came punctually and regularly, and before the time was up was able to ask and answer questions. In class I approached her gradually, standing near her at times as I talked to other individuals, and—after some days—warning her that on that day I should look at her book, but without saying or asking anything about her work. The first words were to come from her, and in time they came.

(3) A boy aged 19. Tall, and growing up fast: strong, loose-jointed, excitable at times, full of explosive energy but easily and quickly exhausted. Eyes overworked by constant concentration on colour and form in artistic creative effort. Fond of argument and the discussion of niceties of abstract thought. At times acutely depressed; dare not go for a walk alone for fear of having "one of his attacks", perturbations so full of dread as to be hardly bearable.

"Often it seems as though my mind is going: it affects my imagination terribly. Can you see yourself standing on a beach, looking out to sea, away to the horizon, water and sky growing into a tremendous . . . limitless . . . expanse . . . infinite——" His words come more slowly, voice more dull, pauses longer, hands clenched till the knuckles show white under the skin. Pulse-rate 60. Or, at a friend's, in the shadow, listening to music with eyes shut: he opens and shuts his hands, grips them to bring himself back to where he is: dare not jump up and rush out, though he wants to run, to throw something, do anything violently. He forces himself to stillness; muscles tighten; his rigid body begins to quiver; a knee stretches and the foot is jerked forward. He is very afraid.

Remarks.—First-aid treatment; controlled, purposed, strong, quick movements for a short time: typical gymnastic exercises are vaulting and heaving, with use of abdominal muscles but with no eye-congestion or pressure. Improvement of circulation and pulse-rate. Preventive; reduction of daily work to 25 per cent. No strong sunlight without proper glasses. Feet to be warm in bed (bed-socks better than hot-water bottle). To eat a little more at each meal, and have a nourishing drink for the night. Work in three dimensions better than in two (e.g. modelling instead of drawing). Curative: regular carefully chosen gymnastics to co-ordinate and improve nerve-technique, and re-establish the circulation and excretion. Massage at first, but not for long, because of its passive nature. Definite planned exercise with a friend, walks, &c. Definite short periods of work, stopping at once when tired or anxious, and turning to more general activity. Definite periods of daily rest lying down. Simple explanation of causes of discords. He found much relief for his eyes in a treatment by exercises which he took. The very frightening disintegration of his brain-activities (falling into a group of scattered parishes instead of a county) was lessened by the definiteness of his new set of occupations, short, purposeful, and never too fatiguing. The improvement of his circulation, the quick discharge of energy followed by periods for recovery, and the better excretion of waste products, together with the purposed focussing of his nerve-messages, seem to offer a more constructive programme than the regular administration of small doses of a sedative day by day—a somewhat negative method of dealing with excitement.

(4) A woman aged 72. Confined to bed owing to the after-effects of an injury to the knee. Normally active and unused to illness, she found the enforced inactivity a real prison. A brilliant scholar, recently beginning to learn two difficult Eastern languages. Whilst she was almost asleep I had given the leg a thorough massage with normal pressure. In folding the bedclothes back into place I chanced to flick the last joint of my little finger against her knee-cap. Her smile changed to a grimace of extreme pain, and "Oh!" she cried, and "Oh! Oh! Oh!" in a series of lessening gasps which ended in a long whistling breath. "The pain," she said, "the pain." I explained that I had just finished a normal massage with ordinary pressure, without awaking her; that the pain was not in the knee but in the nerves from knee to brain: a memory-pain, quite real, but curable. Expecting pain, and ready to feel even a little distress and to send a quicker message as a warning, they send the message too quickly and perhaps even too strongly. (Nerve-endings may reduce strong sensations as well as increase weak ones before transmitting them.) We decided to try an experiment, touching firmly below, then above, then on the knee. "Three, two, one, touch! Does that hurt?" "No," she said. "Now on the knee, three, two, one, touch! Hurt?" "No," she replied: then, after a long pause for thought, "I see I had not sufficient facts upon which to found an emotion."

Remarks.—She had all the bravery and self-control of one who had always kept her body in subjection. The pain was a real pain, a nerve-pattern ready to be lit up like a sky-sign by a suitable message to any of its cells; the technique of their tuning was at fault. That it was in a group of nerves concerned with movement made it more precise, and easier to define than one in a group concerned with living. Her long practice of years of honest thought was quite invaluable as an aid to a better nerve-technique.

The discords of fear may begin in any nerve-group and spread to any other, may start with digestion and finish in thought. The nerve-centres concerned with reproduction are not excepted, but it would be a mistake to think that at certain ages they are the most probable causes of disturbance. They play their part in instabilities, but to call particular attention to them when there is a general unbalance may bring about the very result one wishes to avoid.

It is quite true that fear hath torment, even though this translation of the phrase from John, iv, 18, may be considered incorrect. Just as there is a discord which is fear, there is a harmony which may be described as love, in which (to translate the passage very literally) " our love is perfected; thus we may have freedom of expression in the day of crisis (decision), since we in this universe are not as He is. Fear is not in the love, but the perfected love throws fear outside, because the fear has a restraint of growth, and the one fearing has not been perfected in the love." Imperfection, poor technique, restraint of growth, inability to make a decision, repression, fairly accurately describe a condition which not all our treatment can always disperse. In face of this, and of that final disintegration of our life-form which is death, the most sovereign remedy is the perfected harmony which is eternal.

To use fear, on purpose, as a means of control in education, or in any other human relationship, is a mistake. Discord can never be a basis of health: it may at any time become a medium which produces other discords.

CHAPTER XII

Controls

We alter the heat of a stove by controlling the draught. With more air the fire burns fiercely, with less it dies down or goes out. Anything by which human power is made greater or less may be called a means of human control.

Our activities fall into three groups, taking in, choosing, and giving out. In each of the three, and especially in the second, nerve-patterns play a great part in increasing or reducing energy: practice makes perfect, by means of the nerve-paths which it helps us to make and the skill which we develop in sending just the right messages along them. These things are inside us, but material objects outside also affect our efforts; for instance, we can push a sliding door from side to side, but not up or down. Controls, too, fall into three groups, (1) by self, (2) by others for self, and (3) by others for others. This grouping applies equally to grown-up people and to children; there is no hard and fast line between them. Indeed, since education is regarded as a preparation for life, the controls used for children are purposely based on the principles which are supposed to apply to adults. Some of the following examples are therefore taken from school and others from life in the world at large. In considering the joint activities of two or more human beings, it is important to remember that, just as each of them is composed of a mass of cells which work together to form the individual, so the natural habit of the individual is to work together with others whenever necessary. The natural tendency to co-operate is common to animals as well as to mankind, and is one of the most powerful factors in evolution. It is the application outside the individual of principles which make individual existence possible.

Human activities are so many and various that it is impossible to consider them all. In the following short review the three types of control are set out on the same plan, i.e. whether the messages going *to* the person concerned are more or less strong, whether the choosing *in* the person causes more or less activity, whether more or less energy comes *from* the person. The *to* messages are here limited to those for eye, ear, and sense of touch: the *from* energy is here restricted to that of voice and movement. Some of the controls are direct, i.e. due to nerve-activity only; others are indirect, i.e. brought about by the aid of material or mechanical means. The various groups and types shade into one another, but on the whole they are distinct enough to make classification possible.

Control by Self.—General aim, improved nerve-technique and co-operation. TO. Messages to the eye may be made stronger by attention (as when we watch the amber traffic light so as to be ready for the change to green), or by lenses (as when we use a telescope or microscope). They may be made weaker by half-closing the eyelids in sunlight, or by using an eyeshade or coloured glasses. Messages to the ear are made stronger by cupping the hand to catch the sound, by shutting the eyes, by not breathing, by using a telephone: they are made weaker by putting the fingers in the ears, by not listening, or by listening to or thinking about something else, by sound-proof rooms or telephone boxes, &c. The sense of touch may be made more delicate by softening the finger-tips, or by wetting them, e.g. to feel a weak electric current, or by practice, e.g. in playing a musical instrument: it may be made less sensitive up to a certain point by an effort of will (by tuning-out sensations) e.g. when we refuse to drop an unexpectedly hot plate, or by the use of leather or rubber gloves. IN. Choosing or selecting is made more efficient by preparation, thinking a thing over, reading the score of music before or at a concert: it can be blurred or made less active by thinking of something else, e.g. reading poetry or some quiet book before going to bed, by changing from the thought-patterns of the day to a more restful or pleasing design. FROM. The voice can be made more powerful by shouting, by using a megaphone: it can be made less powerful by whispering, or varying its pitch. Movement can be made more forcible by practice, by rhythm and co-operation, e.g. when five workmen hammer one chisel into a road surface, or by the use of levers and machines: it can be reduced naturally, e.g. by walking on tiptoe, or artificially, e.g. by a screw on a gauge or on the dial of a wireless set. All the three groups can be made more effective together in creative effort, in voluntary homework or in overtime in a factory, or rescuing a buried miner: they may all three be reduced in a state of fatigue, under a sense of injustice, in a strike.

Control by Others for Self.—General aim, preventive, remedial, curative. TO. Messages to the eye may be made stronger by improved lighting, or by the use of spectacles: they may be made weaker by pulling down a blind, or by bandages after an accident or an operation: the action of the eye may be interfered with by suitable preparations, to make its examination easier. Messages to the ear may be made stronger by the speaker choosing a higher or lower register of voice, by operations on the ear, by special apparatus: they may be made weaker by speaking in a whisper, or by quiet careful movement, e.g. in a sick-room. The sense of touch may be made more delicate by repeated tests, or be affected by special apparatus, e.g. a pen which gives small electric shocks through the holder's fingers when grasped too hard, or by the use of tannic acid dressings after a burn. IN. Choosing or selecting can be made more efficient by the use of tonics and suitable stimulants: it can be blurred or made less active by sedatives or anæsthetics, e.g. at a dentist's: it can be harmonized by ritual, or by such encouragement as is called "the bedside manner", or by what is known as "the proper thing", or the good of the school, i.e. by the formation of patterns of thought. FROM. The voice can be made more powerful by lessons in speaking, or by gargling, or by cries of "speak up!": it can be made less disturbing by an operation on the vocal cords, or silenced by forbidding all speech until recovery from laryngitis is complete, or by placing one's finger on one's own lips so as to prevent another child from being overheard by a teacher or discovered during a game of hide-and-seek. Movement can be made more effective by the use of apparatus, e.g. in a gymnastic lesson: it can be reduced by splints or bandages, or by making its rhythm slower, e.g. by tapping lightly with the palm of the hand over a heart which is beating too fast, or by telling a fidgety child to sit still. All three groups together, or any one of them separately, may be made more or less effective by the formation of patterns of thought, new designs of activity in which discord is replaced by harmony, or which are copies of an accepted pattern supposed to be proper, usual, or right, accepted "because it is good for you" even though unpleasant, e.g. getting up early or taking castor oil.

Control by Others for Others.—General aim, obedience and organization. (In this group the natural habit of forming societies and co-operating for a common purpose is often forgotten, and those who work the controls come to rely on them rather than on any natural law. Many, indeed, fail to understand that any such habit exists, and honestly believe that co-operation has to be taught as, e.g., one teaches skating or the making of Latin verse, whereas it is as much an inborn capacity as breathing or digestion. Another mistake is due to a misunderstanding of the nature of human communities. Just as, in the individual, there are processes of building-up and breaking-down and an incessant change, in a community there is always a coming and going, a joining and leaving, a flow of members towards and away from it as long as it is alive. When a community ceases to change it begins to die. Much of the control by others for others aims at keeping it unchanged—a vain effort. This group also includes controls intended to protect the community from those who are physically or mentally ill.)

TO. Messages to eye and ear are made more striking by loud-speakers and by posters or headlines: those to the sense of touch may be exaggerated into corporal punishment. Those to the eye may be reduced by making a child stand in a corner. All three together may be cut down almost to vanishing point by solitary workless confinement. IN. (i) A very common practice is to link up an existing pattern of thought or of action with one which produces a discord in the individual concerned, e.g. to say to an irritable child " If you don't go to sleep the black man will get you ", or to a first offender " If you do this again you will be liable to six months' imprisonment ". The theory would seem to be that rather than endure the second discord the individual will resolve the first into harmony. This may sometimes happen, but even where it does it leaves the person with a memory of a second discord which was greater than the first, a memory which is not easily forgotten and which when recalled may cause a further discord. Or, both discords may survive, and cause anxiety or fear or repression. In either case the person so controlled is apt to accept the idea that one discord can resolve another, and to carry the theory into their own practice. The error lies in supposing that one nerve-pattern is changed by stamping another across it, or that a wireless station can be prevented from sending a message by jamming this with another message. The disadvantage of discord is that it causes functional disorder which may end in structural change. (ii) A still more powerful control is found in forming patterns of thought which have as their central motive the good of the community. Very naturally, since all human beings have the habit of co-operation and since common effort is the very basis of evolution, distrust and dislike of anything which may hinder it are easy to arouse. Great advances are being made in this form of control: it has been found that, by beginning at an early age and sending the required messages along the appropriate nerve-paths sufficiently often, vast numbers of individuals can be trained to think the same thoughts about almost any given subject. Thought-patterns are arranged for them like electric signs: press a switch, and the neon lights or the nerve-cells flash their message across the dark background of the mind. " Guinness is good for you ", " Your country needs you ", " Carthage must be destroyed ". The dangers of the method are obvious: it standardizes selectivity and it kills the power of choice. Instead of originality we have reflex action, instead of a musician we have a musical box. And, as the higher centres of thought wither from disuse, the lower and more primitive emotions become more powerful. This form of control may prove an obstacle to human progress. FROM. Movement is made more productive by the use of machines, of which one worker may tend several: strength and time are saved by bringing the work to the hands on moving belts, each worker specializing on one process. In this way patterns of movement are simplified, though often at the cost of skill in movement in general and of a special fatigue in the nerve-cells particularly concerned, or of a widespread and vague feeling of frustration due to the impossibility of ever finishing a complete creative act. In schools, a similar simplification of movement makes it possible to train large numbers of children in physical exercises at the same time, at the cost of skill in movement in general and of individual initiative. Where, in the interests of others, movement is to be restricted, this can be done by confinement in institutions, in mental hospitals, in padded cells, in prisons, in straight-jackets. When thought necessary, movement can be subdued by sedatives, or completely stopped by capital punishment, or by a bomb.

Of the three groups of controls, by self, by others for self, by others for others, the first is obviously the best. The second is useful in so far as it never loses touch with the first and merges into it at the earliest possible moment: where doubt exists as to whether this moment has been reached, the opinion of the controlled is at least as important as that of the controller. The value of the third is less clear. Specialization undoubtedly saves energy which can then be spent on a single process, but since this is done at the expense of general ability the control in the end makes but a partial perfection. As regards restriction, though at present it may seem necessary to limit individual activities to some extent in certain cases (e.g. by putting a fence round a baby in a room, or by confining a troublesome child to the school grounds, or a pervert or a maniac to an institution), it is as well to remember that this is only a compromise and that we do so because we have not yet found a better way. Restriction is negative, and of itself does little or nothing to remove the cause of the original discord. The complete and permanent arrest of movement by a gallows or a gun is not control at all: it is destruction, a confession of failure.

Every community to-day contains individuals who are sincerely convinced that they are fitted to exercise controls of the third type, by others for others. Often they are persons whose sense of tidiness and of organization is definitely morbid. When they also show a tendency to rely on external control rather than on the inborn human habit of co-operation, any schemes they may suggest should be most carefully examined before they are adopted, especially if they are put forward in the interests of the community, whether this be a school or a nation.

CHAPTER XIII

Physical Education

Physical education is education through movement. There is more in this than meets the eye: it is not as simple as it seems. Just what do we mean by physical, or where does physical end and mental begin? Imagine a batsman or a tennis player before, during, and after making a stroke: how are we to divide exactly into physical and mental the many happenings in brain and heart and lungs and limbs? If we think of the player as an individual made up of two distinct parts, body and mind, we shall get nowhere. If, on the other hand, we start with the idea of the single nerve-technique for all activities, it is fairly easy to decide how this shows itself in living, moving and thinking as the action takes place. We shall get an impression of the individual as a unity, a whole, performing and being affected by a complex series of activities which together make up what we call a movement. As a part of the game the stroke is itself important, but more important still is what takes place in the player. Should it even for a fraction of a second unify the individual, the movement may be counted as a step forward in evolution.

Education is another misused word. Very often it means no more than schooling, learning, preparing for some examination, or (narrower still) training. The diagram of nerve-activities in reading aloud, p. 43, shows a " nerve-pattern ". The object of training is to construct such nerve-patterns, to standardize them whether in movement or in thought, so that at a given signal they may produce an almost automatic response, the nerve-messages lighting them up as it were, like so many neon signs. The object of education is to help each individual to create fresh patterns as occasion may require: its purpose is to provide conditions suited to further evolution, in and through which the individual may become more complete, more unified. Instead of education through we have come to think of education for, for industry, for commerce, for this or that, for movement rather than through movement. Education for is concerned with learning; education through is directed toward wisdom. With this in mind it is clear that the real value of a subject of study is the extent to which it unifies and perfects the student.

Since the individual has only one nerve-technique for all nerve-activities, this technique may be improved equally well in any of these activities, whether in music or mathematics or movement and so on. Education through movement includes both theory and practice. Stated in simple terms, theory of movement has to do with (1) bones and muscles, (2) how they move, (3) what they need, (4) how they grow. Of these, the first is connected with anatomy, the second with mechanics and physics, the third with physiology and chemistry, the fourth with biology. Practice of movement has to do with (5) learning movements, (6) watching movements, (7) creating movements, (8) corrective or remedial movements which form a special subdivision of practice. Of these, (5) has to do with quality and rhythm, and is allied to craft and music, (6) is concerned with the study of shapes and the way in which they change, and is connected with drawing, painting and modelling, (7) has to do with original composition and expression, and may be compared with design, dance or mime. But anatomy, mechanics, physics, physiology and the rest come under the head of science, while craft, music, drawing, modelling, design and so on come under the head of art. The study of movement, in its theory and practice, thus forms a link

THE RELATION OF PHYSICAL TO GENERAL EDUCATION

Physical Education

Science	*Theory of Movement has to do with*	*Practice of Movement: General*	**Art**
ANATOMY	1. Bones and Muscles	5. Learning movements (quality and rhythm)	CRAFT AND MUSIC
MECHANICS PHYSICS	2. How they move	6. Watching movements (studying shapes)	DRAWING PAINTING MODELLING
CHEMISTRY PHYSIOLOGY	3. What they need	7. Creating movements (composition and expression)	DESIGN DANCE MIME
BIOLOGY	4. How they grow	8. Special corrective or remedial movements	

Applied Movements

Games, Athletics, Dancing, Boxing, Fencing, Wrestling, &c.
Some Vocational Training

between science and art and offers a means towards the integration of education.

The study of movement may be either general or specialized: the former deals with the well-being of the individual as a whole, the latter with particular activities applied to a particular purpose. General study characterizes the gymnastic lesson, which includes all types of movement: specialized or applied movements have a special purpose in view, e.g. preparation for or practice of games, sports, athletics and the like. Since these require rather more standardized effort they depend more on standardized nerve-patterns, and partake rather of training than of education: they are special developments of the general study, and include some forms of vocational training. The corrective or remedial subdivision of movement is re-educative or re-creative: it is on a par with the special coaching of individuals which occurs in the study of other subjects. It is not limited to the treatment of bones and muscles which may have been affected by accident or illness or the handicaps of environment, but includes in its scope the re-establishment of a nerve control which may have been interfered with by some sickness, or become disordered through unsatisfactory expenditure of nerve-energy or a lack of balance between expenditure and recovery. It frequently proves of value in cases of anxiety or fear, and it provides an unrivalled field of research into such nerve-discords as are at present classified under the head of backwardness, instability, defect, delinquency or crime. Examples of this branch of education through movement are given in another chapter.

Just as education through thought has been divided into subjects of study, the knowledge of which has become more important than their effect upon the student, so education through movement has been split into parts and has lost sight of its central aim, which is to unify the individual. The applied movements of sports and games, which should grow out of the more general education, are often used as introductory to it, a reversal of the natural order of things. As for the general education itself, this has been torn in two, and the movements in which apparatus is needed have been separated from those performed without it. The latter, the so-called free-standing movements, take up less space than the former, and thus permit of larger numbers being dealt with at one time. These are now called Physical Training, or P.T., and are thought of as quite distinct from apparatus work. The latter is now called Gymnastics, and is thought of as a sort of acrobatic performance. It has been forgotten that apparatus is used to localize a movement, to simplify it or to increase its effects, and that it thus forms a most valuable aid in the early stages of study and with the very youngest or most unskilled persons. It would be more in line with a proper understanding of physical education to say to a class, "If you have done your apparatus work really well, as a special favour you may practise some free-standing exercises." This and other misunderstandings of the subject spring from the mistaken idea of education for rather than through movement. In apparatus work especially, the movement becomes more important than the mover: the tendency is to think that because you can do this or that you must be strong. In free-standing exercises there is an idea that if you work through a list of them you will be well. Gradually the lesson becomes a more or less automatic performance of memorized movements, a standardization of nerve-patterns, an obedience to an external discipline rather than a developing of an internal self-control, a stencilled repetition instead of a design for evolution.

Insistence on the importance of the student rather than of the subject of study, of the mover rather than of the movement, in no way interferes with class or group work: on the contrary, it is the very basis of success. Where a number of persons work together, two facts are important. First, since they are all human beings they all have something in common; second, because they are all individuals they are all different. Out of the first grows the main scheme of the lesson: from the second arises the need of scope for varying abilities and powers. The successful teacher is one who best combines these two. The fuller the teacher's knowledge of each individual of the group the better will be the combination, in the widest range of personal activities or in the most complicated co-operation for a show or a display. The educational and evolutional value of the work depends directly on the teacher's vision of each member of the class as a unity and of each movement as a unifying activity. This is in no sense work for an instructor. Teacher differs as widely from instructor as pianist from organ-grinder.

Systems of physical education are almost as numerous as nations, after which many are named; Swedish, Danish, Polish, Italian, French, German, and so on. There is also a whole crop called after individual inventors or compilers; dancers, doctors, lieutenants, musicians, professional strong men, and dealers in apparatus. Still other systems specialize on a particular part of the body: there is one which deals with the abdominal region, one which concentrates on the rhomboid muscle, whilst those which claim to add to or subtract from height or weight or chest or waist or hips are too numerous to mention. The best is what is called the Swedish System: its apparatus is intended to aid human development rather than to provide a list of exercises. To be quite accurate, it was never designed to meet a national emergency, but was elaborated by a teacher—Pehr Henrik Ling—in order to assist the education of his pupils. He would no more have thought of calling it a Swedish system than Harvey would have spoken of the British circulation of the blood. Though special skills may have a national or racial character, e.g. pelota or country dancing, education through movement is general and human and unrestricted to race or nation. There is, however, said to be a British System, peculiarly adapted to and springing out of our national character. As far as general education is concerned, there is nothing especially British about a spine or chest, or lungs or arms or legs, and there can be nothing national about the exercises through which they are developed. The applied movements of games and sports on the other hand have a definitely local colour, though quite often it is in details rather than in general plan that the game is distinct. On closer study the British System proves to be a good example of our haphazard habit of compromise. We have our own versions of football and cricket; hockey and golf may be of Greek or even earlier Chinese origin; lacrosse is Amerindian; tennis grows out of a French jeu de paume.

Looking for the best of foreign practices for our general physical education we decided to adapt the Swedish fashion to our needs. With over five million children to educate, most of them leaving school at or about the age of fourteen, these needs were great, and to supply them fully would have cost more than we were prepared to pay. We compromised by taking only those exercises which could be done with floor and walls, and leaving out those which required apparatus. To-day we are slowly progressing from Public to Elementary, from Girls' to Boys' schools, providing gymnasia (the class-rooms or laboratories) in which education through movement may be carried on. As yet, however, the vast majority of children in the Grant-aided Schools of England and Wales (who in 1935 numbered over six million) have nowhere to hang by their hands and stretch their chests, and correct some of the faults produced in bone or muscle or nerve by the sitting position to which they are restricted for so many hours per day. The six or seven hours daily sitting (at school and home) for Elementary may increase to seven or eight or even more for Secondary Education and, as examinations draw nearer, the extra time needed for intensive thought is gained at the expense of education through movement. Girls' schools are often better than boys' schools in this branch of study, and in Elementary Schools great advances are being made in spite of overcrowded classes, and the quality of movement obtained is sometimes excellent. But generally speaking, in spite of obvious improvement in many directions, our system of physical education is very like the borrowed house of the hermit crab, an external addition, ill-fitting, in no sense evolved from the organism it encloses, a temporary makeshift. That this is so is due in the main to three causes, a desire to avoid expense, an unwillingness on the part of those responsible for education through thought to give up some of their lesson-time to education through movement, and the common error of imagining the human being to be a compost of two separate elements—body and mind.

The tearing in two of physical education and the separation of " gymnastics " from " P.T." have made it possible for a number of otherwise reputable schools to arrange for all their pupils to perform what are sometimes called their " setting up " exercises at the same time. They are parcelled out in convenient groups among older or more experienced scholars who control and attempt to correct them. This may be training but it cannot be education. Movement is produced by nerve-messages and, however valuable it may be to the bones or muscles or organs concerned, its central importance lies in the improvement of the nerve-technique and the unifying of the person of the mover. The teacher's appreciation of form and sense of rhythm and skilled knowledge of the subject are essential. In no other branch of the curriculum would such delegation of expert teaching to unqualified pupil-teachers be encouraged, still less regarded with pride: it is impossible to imagine a good French accent being acquired by such means. Yet the delicate inflection of a sound is no more delicate than many of the nerve-messages controlling movement. Though in a few schools a few teachers may have managed to produce a group of senior pupils with a working knowledge of the effects of what is being done, in the majority of cases this drill—for it is nothing more—is and must remain a cheap substitute for a real thing, and an evidence of the failure of teachers to grasp the full meaning of physical education.

One of the great advantages of education through movement is the number of opportunities for friendly co-operation and mutual aid which it provides. Individuals in a group learn to help one another, to correct as well as to observe faults, to combine in exercises which need assistance, in getting out or putting away apparatus. There is always a special joy in working with others. This combination or co-operation is not something new which must be taught afresh to each generation of pupils: it is a pre-human habit which needs opportunity for exercise, and in the gymnastic lesson such opportunities are many. There is a school of thought which considers co-operation to be an acquired and not an inherited tendency: to those who hold this view co-operation means the team spirit, and this in turn means leadership. In its natural state, the team spirit is the active principle of co-operation, the mutual aid by which both animals and men cope with their environment. In modern times, and especially in physical education, it takes the form of playing for one's side against another side or team, the full number thus co-operating for the game being twenty-two or thirty, not as is commonly taught eleven or fifteen. By a further extension this special co-operation is made to apply to the community as a whole, and to regulate the activities of the individual. Where it is rigidly applied, the principle of service to the community may develop into a new religion or philosophy or a new form of slavery. Examples of such rule are to be found in several countries to-day. To those who believe this artificial form of the original natural co-operation to be both necessary and desirable, instruction in movement will offer a tempting bait and obedience to an order will seem to be an end in itself. The orders in the gymnastic lesson are not, however, commands. They may be defined as sounds which show when the movement should begin. And, since the purpose of the movement is to unify the individual, the order marks the instant at which the individual passes from a passive to an active state of self-control: there is no question of obedience to an external authority. But, where obedience to authority is considered to be an end in itself, there is no branch of study in which the directions of the teacher can be more successfully perverted from their proper use than in physical education. In two spheres of adult life obedience is especially stressed, viz. in industry and in the Services, and since the former controls a far greater number of the population than the latter it may be expected to be the more interested in the training of its workers in discipline in the schools. Those engaged in education through movement would do well to remember that the directions and orders which they give are merely signals to their pupils to begin their own active control of themselves. The special needs of industry and the Services require training for rather than education through movement.

Another drawback to team-work is the handicap it may place on the less competent or able member of the group. In teams the best usually come first and those who are worst last. In games and sports competition plays a great if not the chief part: it belongs to the applied or specialized movements, but it should never enter into the general education through movement either as a basis for awards or as a means of stimulation. If grades of any kind are to be used they should be such as can register an improvement on one's own previous performance; they should never compare the failure of the worst with the success of the best. A clumsy movement hesitatingly made may contain more honest effort than the easy action of a natural mover.

A word on leadership. Authority has always been known to have special dangers of its own. In the early Roman State two consuls were always appointed, so as to guard against these risks. In special circumstances a special magistrate was chosen, *magister populi* or *dictator*, but only for a specific purpose; that done, his authority immediately came to an end. The modern fashion is to appoint the dictator *in perpetuum*. In physical education, where a group of forty is divided into four teams of ten, there are four leaders and thirty-six who are led. In these circumstances training in leadership really results in training in being led for the majority of the group. Apart from the fact that we are concerned with education and not with training, such results are not unconnected with adult life. It is not in the general interest of the community that ninety per cent of the population should look to others for a lead. It is wiser to extend the old Roman principles and to appoint the leaders for a definite time, and then let others practise. It would be wisest to remember that the duties of the leader are those of a prime minister, or first servant, to the group.

The fewer the clothes the freer the movement. *Gymnos* in Greek meant one who is lightly clad or unclad. Our customs and our climate combine to make unclad movement undesirable: we may translate the word *gymnastes* as a person lightly clad, *gymnasion* as a place where such persons practise movement, and *gymnastikē* as the practice of movement. Gymnastics is an inclusive term which covers all forms of movement through which we are educated. Similar terms are mathematics and physics and, in the singular, music. The singular form is originally adjectival, but is often used without and instead of the noun: "a proper gymnastic" would mean a considered scheme for the practice of movement. (Such a scheme would prevent the absurd overloading of the summer term with games and sports and "P.T." and "gym" as well as examinations. The co-ordinated expenditure of energy would be the work of the gymnastic teacher.) It is beside the point to argue that in this country gymnastics means exercises performed with apparatus, and that this is therefore the proper meaning of the word: we might as well say that because it is a common habit in London the proper pronunciation of mother is "muvver". Clear concepts and clear expression are essential to clear thought. We need to think of an individual as a unity, of education as a unity. We have seen how education through movement unifies science and art, how it consists of theory and practice. We need an inclusive term to unify our concept of such practice, and this is just what the word gymnastics does. It is precise and accurate and covers all the facts. Not only does it define the subject; it also defines the work of those who teach it, and their position in the scheme of education. The gymnastic teacher and the music teacher, or the teachers of gymnastics and mathematics and physics, take their places as equals and colleagues on the staff of the school: the instructor in physical training will always be a subordinate, an instructor and not a teacher, engaged in training and not in educating.

The teaching of movement is an art, not imitative and mechanical but living and progressing. If the pupils are to perform only those movements which the teacher can demonstrate there is an end of progress. The aim of gymnastics is threefold, to raise the subnormal to normal level, to maintain general well-being and to develop special skill. In developing special skill the pupil may, and should, progress farther than the teacher: this is a natural stage in evolution. Such progress will, however, be chiefly in performance: in knowledge of the subject the teacher will still remain more expert. It is a mistake to assume that only those who can perform a movement should teach movement, that only the young or the early middle-aged can effectively take charge of physical education. The age-limit for teachers of gymnastics is the same as that for teachers of mathematics, an age at which knowledge becomes vague and wisdom loses its force: it is not a question of calendar years but of creative art.

The old idea of the individual divided into body and mind has led to many errors: of these perhaps the most harmful is an over-insistence on active movement. To be efficient, movement must employ only those muscles which are needed; the others should be relaxed. There are, however, times at which general relaxation is necessary. In more primitive conditions this is obtained in sleep and in lying down. Modern life makes lying down during the day less easy, and the activities of our waking hours at times invade our sleep. The habit of general relaxation is gradually being broken. It should be practised in every gymnastic lesson. Still more, a period for relaxation should be arranged as a regular part of school life, a time in which the growing organism may be horizontal instead of vertical, may lie down instead of sitting or standing or walking or running. This is only common sense. Not the least of the tasks of the teacher of gymnastics is to help to adjust the load of education to the individual child, to secure a proper balance between expenditure and recovery of energy. For this, it is essential that teachers of other subjects shall know the meaning and purpose of education through movement, viz. to unify the individual. With their help much may be accomplished; without it little can be done.

CHAPTER XIV

Re-Education

The part of the practice of movement dealing with the raising of subnormal activities to a normal level is not yet recognized as being a branch of education. Because some of it deals with feet and spines or fractures and strains it is all thought to be a kind of nursing and to belong to the sick-room or the sanatorium. Since these places are under the control of the doctor it has come to be called medical gymnastics, a quaint term which might equally well describe a general practitioner turning head-over-heels. Work in the remedial gymnasium is best defined as re-educational: it is a special teaching, by special methods, of individuals with special needs, and corresponds to the special coaching which is given to those who have fallen behindhand in other subjects in the school. In its nature it is not medical but educational: it is best carried out by an expert in movement who has inside knowledge of school conditions and, preferably, teaches some other subject as well. The purpose of this as of other education is to improve nerve-technique, the only difference being that the medium used is movement rather than the printed or the spoken word. A short account of a few individuals dealt with in this way will give an idea of the variety of needs which may have to be met. (Though mostly boys, the general principles apply equally to girls.)

1. Boy: 17 years. Right elbow strained and cannot be fully stretched. After nearly two weeks' massage and movement he could get it nearly straight, but it always stopped about ten degrees short of full extension, as though the joint

were blocked with a wedge. Whilst I was holding the lower arm in my hands he had occasion to turn his body and look over his left shoulder, leaning away from me as he did so. The elbow straightened out, but locked again at the same place as he turned back. He refused to believe it had ever been straight, and showed me how it " wouldn't go ". I asked him to turn away and lean back again; then, when the arm was straight, held it so and told him to look at it. " Oh yes," he said, " I see," and he bent and stretched it fully, and the cure was complete. (Sit at a table, with the lower right arm supported on it: turn to the left and lean backward, leaving the right hand still, and the movement will be felt.) Immediately after the original injury, probably in a few moments, he had made for himself a " muscular nervous splint " which stopped his lower arm from moving away from the upper, from being fully stretched. He had, however, made no nerve-technique for stopping the upper arm from moving away from the lower. When after treatment the freedom of the joint was regained and the swelling and pain removed, the nerve-lock (though no longer useful) remained as a memory. The remedial work here consisted first of massage (which is in essence passive movement) and then of passive and active movements of various kinds, and lastly of a quick approach to his conscious mind. The failure to stretch the arm was at no time imaginary or invented: it was an honest error in his nerve-technique.

2. Boy: 14½ years. Had a nervous twitch affecting his body above the hips. With arms half bent, the elbows were pressed into the sides and then pulled upwards with a shrug of the shoulders, which were then moved in circles once or twice: the neck was then bent forward and backward and the head turned from side to side: the whole series of movements lasted two or three seconds. It began in the autumn term, and we found out (together) that he often lost or forgot his belt and that his football shorts then tended to slip down over his hips. The harsh blue-dyed

wool of his sweater tickled his very sensitive skin. The arm movements pulled his shorts up without his using his hands: the shoulder and neck movements relieved his skin irritation: the whole series became organized into a pattern or habit. After games, the pressure of a collar on his neck was enough to start it all again: finally he used it to express general irritation, discomfort, or uncertainty. A belt provided, the sweater changed, and the causes were removed. The habit-memory was broken up and redesigned by combining the various movements with others into new patterns (or exercises). The general fatigue which had taken this particular shape was met by arranging periods of extra rest lying down during the day, either in the remedial gymnasium or in an adjoining rest-room. He was encouraged (as an exercise) to lie quite still, with no movements but those of breathing, for five minutes, his face being left smooth and unwrinkled. This took him three lessons to learn, and the first time he did it he fell fast asleep, and slept for half an hour. This habit of restfulness and sleep gradually extended to the dormitory.

3. Boy: 15 years. During one week he collected from his various teachers the sum of four hours' extra work, to be done on a half-holiday. Knowing his available energy and his normal nerve-technique, I felt that this was an unusual variation from his usual ups and downs, and obtained the loan of him for the half-holiday, providing him with a deck-chair in the sun (or the choice of a couch indoors) and a written statement that for the afternoon he belonged to me—this to clear him from the authorities. He brought two magazines, read for a while, and fell asleep. At sundown (about 4 p.m. spring term) I woke him and sent him for the usual afternoon food. He came back and went to sleep indoors. Three days later he was in the sanatorium with measles. Presumably some of his extra work had been given him because he was in the early stages of the illness. This occurrence first directed my attention to the possible

value of a rest-room as a regular part of the school premises, to be used at will. I have never known it abused: I have on occasion seen it prevent a nervous breakdown.

4. Boy: 15½ years. Tall for his age: growing fast: slight lateral curvature of the spine: tired insteps. Routine treatment for these—massage, exercises and daily periods of extra rest. A habit of leaving one side of the face unused and of talking rather more with the other side of the mouth was likely to prove troublesome in later life. He said he had always had a one-sided smile, and seemed unable to change it. Muscles of the unused side weaker and lacking in tone. He could, however, purse his lips to blow out a match, though whistling was impossible. With a large mirror we both practised lip-pursing, one, two, one, two. The next exercise I did alone, "Pillar-box": corners of the mouth pulled wide apart, lips lightly touching. We then tried it together, he using fingers to help him. "Now hold it, fingers away!" He did so, looking into the glass: then both corners of his mouth rose in a smile and he said, "But it looks so silly." Exercises for face-muscles, both sides together: "Football", all blown up; "Dimple", all pulled in. Then either side alone, or alternately. Daily practice for a few minutes. Before the end of term the contours of the two sides of the face were almost equal. Such subnormal activities may be caused at birth, in difficult or prolonged labour, or by illness, or by imitation. Even where some nerve-path is actually closed there are often others which are open but are not used: when these are once more brought into play the extent of the handicap may be reduced.

5. Boy: 17 years. Shy, clever, a scholarship candidate whose writing was so bad that no examiner would be likely to read it: it also wandered up and down the page, and grew worse as his grasp of the pen grew tighter. Chances of success in examination problematical. In writing which is to be read, the top half of the words is more important than the bottom half, though it is better if both are level. I made

him a polished surface of thick cardboard, with three parallel wires let in flush so that they could not be felt. The lower pair were for the top and bottom of the words, the top one marked an extreme limit of error. On this he wrote with a pen the nib of which was a fold of wire. Wires and pen were connected with a battery, each of the lower wires with a buzzer tuned to different notes, and the top wire with a bell. Writing was done with eyes shut (to increase the sense of touch). So long as it was good the buzzers said "Hee! Haw!": when bad, the bell cried "Shop!" A second set of three wires, closer together for smaller writing, was put in later. I also made him a simple pen with a metal rest for finger and for thumb (ordinary nib) which when wired to an adjustable coil and to wrist would give him a slight finger-tip or thumb shock as pressure increased. He himself controlled the coil: the game was to feel as slight a shock as possible. Results satisfactory.

6. Girl: 17 years. Troubled with a stammer, increasing with fatigue of preparing for an examination and with anxiety as to the result. Interference with breathing largely localized along lower ribs and diaphragm. Routine treatment by suitable breathing exercises (and of course by reducing work where possible and getting her to make some time each day for recreation) and practice in reading aloud. A useful method, where possible, is to divide and regroup sounds so that the one which causes trouble comes at the end of one word rather than at the beginning of the next, e.g. "This is not *so b*-ad". She found her trouble worse in English than in French, so we tried reading English, French, German, Latin, Italian and Swedish. The less she knew of the language the less she stammered. The point is interesting and worth study.

7. Boy: 17 years. Tall, growing fast, sensitive, excitable, unstable (quick irregular ups and downs), narrow margin of energy, soon burnt out, recovery fairly quick but becoming progressively slower: attention widespread and dispersed.

Giving him an exercise for his breathing (my left arm across the front of his shoulders, my right hand on his spine, for chest-lifting trunk bending backward), I felt his body grow limp, with a loss of muscular tone. I at once asked him a simple question and got no answer: then a second question, and I got an answer to the first, after a delay. The temporary interference with thought and movement and muscular tone may have been due to several factors, a cessation of nerve-messages, an insufficient supply of blood to the brain, poor ventilation of the chest due to shallow breathing, failure to get rid of products of fatigue, even perhaps the deep breathing itself. This was an extreme example: on some days his power of work would last no more than five minutes. He needed short periods of effort with definite purpose and producing an almost immediate result, and followed by relaxation. Such work can be more easily found in the gymnasium or the studio than in the class-room. Similar changes of energy and attention, though less marked, must occur in almost every lesson almost every day. It is little use urging such people to pull themselves together with an effort: they need help and time in which to do so. It is worth noting that the factor causing the failure was common to both moving and thinking.

8. Boy: 14½–15 years. Tall for his age, slight, growing fast, sensitive, inattentive, clever, troublesome, charming. Control of movement at times excellent, at times unsatisfactory—even silly. Carriage often good: often has head turned sideways and eyes downcast, a hang-dog look of naughtiness: often noisy, thoughtless and seemingly inconsiderate, yet always polite. (Words with an ethical content are unhelpful in framing a diagnosis.) He had had cerebrospinal meningitis and middle ear disease. The latter with its resulting deafness was enough to explain the carriage of his head and ear: the former would account for his dispersed technique of thought and his excitability and inconsequence (silliness). The real person was the child at

his best, holding himself and moving well, sensitive, polite, clever—all of this without effort. When excitable, inattentive, thoughtless, noisy, he gave the impression of being under strain and anxious for relief. Treatment, extra rest during the day, short periods of concentrated effort followed by relaxation, short quick " explosive " movements, avoidance of over-fatigue. His periods of disturbance were intermittent and could be predicted from his behaviour with some accuracy, and the staff could be warned and were unusually helpful.

9. Boy: 15 years. Not tall: quick in movement, sensitive, musical, quite clever in classwork. Had a delicate sense of touch, colour and form: found pleasure in the feel of velvet and other fabrics. When asked a question (especially if very firmly or rather abruptly or crossly) would give any answer which seemed at the moment likely to please the inquirer, and thus got a reputation as unreliable and untruthful. When undisturbed by anxiety or hurry was quite trustworthy. This is a type of " lying " which is caused by an individual's distaste of discord, an unwillingness or even an inability to tolerate the feeling of being out of harmony with anyone. It differs entirely from the cold and calculated perversion of the truth for the sake of self-advantage, and would be better called by a different name. It is quite a normal reaction in many hypersensitive people, and care should be taken not to arouse it. It is an early stage in the development of anxieties and fears and repressions. There is no more reason to speak with sudden harshness or abruptness to a sensitive child or adult than there is to snatch suddenly at an animal. If necessary, speed is best got without haste.

10. Boy: 5 years. Slack abdominal muscles, poor breathing, weak insteps, facial muscles relaxed, tongue hanging out and down towards chin: narrow margin of vitality, quick fatigue. Taking-in nerve-messages, good: choosing or selecting, good: expression of thought by speech reduced at least seventy per cent. Under this handicap, general

nerve-technique blurred and inadequate. Breathing interfered with: normal play impossible, both from lack of air and from a feeling of difference from other people. In eating, when moistened with food or saliva, the tongue could be used not too badly. Formal exercises useless with such a young person, at any rate at first. His co-operation was essential to any improvement. Blowing bubbles made a good introduction to better breathing and to better tongue position and tone of muscles of mouth and face. He liked playing with a ball: it was arranged he should play with a stoutish indiarubber balloon, which he first blew up to suitable size. (This can be more quickly closed or opened with a rubber band than with string.) Later, he used a small football bladder: a wooden mouthpiece for the stronger rubber is useful. He was encouraged to drink through two straws at a time at first, later through one. Before the end of a month he blew up the small football bladder till it burst. Meanwhile, tongue and face muscles were reconditioned and speech became possible.

11. Boy: 7 years. Reported to be a liar, thief, bed-wetter, bully, dirty in his habits, dribbling at the mouth, and (in the opinion of one observer) almost degenerate: occasional whippings had failed to cure him. Sent away from school as "antisocial". The mouth-dribbling was connected with a stuffy nose and the loss of three front teeth, and a careless management of saliva. The bed-wetting was associated with an inflammation of the lining of the outer urinary canal, and cleared up with a short general treatment with ultra-violet rays. An electric torch for the nights made getting out of bed rather fun. What had been thought to be self-abuse and was merely the scratching and fumbling with an irritated part of the body also finished. The thieving disappeared when he was given for his very own some books, a pencil, ruler, indiarubber, which he could be asked to lend. He then learned to put things back after asking permission to borrow them. The bullying was a normal

product of repression, and ended when repression was relieved. Cleanness of body meant cleanness of clothes and a less noticeable neighbour for others. What is called " anti-social " conduct is as likely to be produced by the failure of society to adapt itself to the individual as by the individual's failure to adapt to society. In this case improvement was made possible by a kindly person who took him from school for three months.

Cases of partial paralysis, " infantile " and other, are not so uncommon as is generally supposed. The routine treatment of the muscles directly affected is of course desirable, since all possible improvement in movement must be got. By itself, however, it is not enough. There is often a widespread disturbance of nerve-technique due to the shock of waking from sleep to find that an arm or a leg is lying useless, immovable: there may also be some results of illness which while they have not quite closed some nerve-paths have made it difficult or for a time impossible to send messages along them. In such cases it is necessary to go over the whole nerve-technique, not of course all at once, but gradually over a period of months—slowing down impulsive nerve-messages, quickening slow ones, redesigning nerve-patterns in movement and thought. In time an almost irreducible minimum is reached, a sort of sediment of damage, when nothing more seems possible. But even here there is still some hope of more improvement: the work done on the nerve-technique in general remains, and the individual can then continue to extend it bit by bit. Though complete recovery may be impossible the handicap of paralysis can often be lessened to a degree which at first would have been considered entirely out of reach. The similarity between the nerve-discords in movement and thought is plainly an identity. Treatment may well be continued for a year or even two.

CHAPTER XV

Summary

An interesting sidelight on harmony and discord in living organisms is given by Professor M. G. Evreinov in an article on " Electricity as a Factor in Organic Processes ". Referring to experiments in cleaning grain before storage he describes the thermal effect of a high-frequency field on a bee and a weevil. Instead of the insect with the larger mass and the higher specific heat perishing later than the smaller one with lower heat, the bee died much sooner because of the peculiar structure of its nervous system. He goes on to say that " not only excitation but *very grave disorders can appear in* the system and in various organs and in *the whole organism when* high-frequency electromagnetic fields or *currents of a frequency close to the natural frequency of the system are applied* ". Apparently the idea of discord as a cause of disease has spread beyond the laboratory to commercial agriculture. It is easy to understand why the more complex organism suffers sooner from such disturbance than the simpler one. The still more complex nervous system of the human being may be expected to tolerate discord even less successfully than that of the bee. We need not hesitate to speak, quite literally, of the harmony or discord of a nervous system, of a nerve-cell or group of cells, or to take it for granted that the actual material of which a human being is composed must establish some sort of internal harmony or resonance if it is to continue to live. We may accept the three phases of nerve-activity, even under such simple names as taking in, choosing, and giving out: their more dignified descriptions (sensory, associative and motor) have long been approved. Nor need we hesitate to use the fourfold nerve classification living, moving, making, thinking. (Some say they prefer " existing " to " living ": I have chosen " living " because it has two syllables instead of three and is therefore easier to remember.) They are arranged with scrupulous accuracy in genetic order, in order of evolution, and are no less respectable because they offer a useful basis for classifying school activities. Such compound words as nerve-activity, nerve-path, nerve-message, nerve-pattern need no apology. Nerve is better than nervous since nervous has come to mean something imaginary or pretended or unreal, whereas a nerve is an actual thing which one can see under a microscope. Also, the terms are in a tongue understood by the people, which is sufficient excuse for using them, if any were needed. The idea of energy streaming through us from without is taken for granted in radiology, of its being transformed is accepted in heliotherapy: that of wave-length or frequency is understood by nearly everyone who has a wireless set. The only risk in taking bits from various branches of science is that we may make a crazy pavement instead of a coherent design. To me, the proof that it is more coherent than crazy is that this terminology, this set of words and phrases, covers all the facts (where facts are available), and without distortion or strain allows for fresh data. Also, and this is a very practical advantage, it makes it easy to explain to those with whom I work what I think we had better try to do and why.

Stated in terms of nerves, it seems plain that each human being has his or her own single technique for all activities. Whether these be digesting or dancing or drawing or debating, Tom, Dick or Harry or Mary or Ann do all of them in their own particular style. Each person has but one mode of life: the individual is indivisible. Well-being can only be maintained if all the activities are harmonious. To find out which activities are best suited to each of us we need to experiment, to try this and that and the other until we discover what we do best, what we would most like to do or be, what is the next best, even what will do as a third string to our bow. This is obviously a task in which school can help us from the very earliest age, to focus our energies on a self-chosen purpose. In discovering our preferred activity we begin to find ourselves, even in early childhood: given a chance to pursue it as adults we may continue our evolution. In this process of individual perfection there need be no risk of selfishness, since by ourselves we can do nothing: we need to co-operate with others, and others with us, a habit to which we are driven by a prehistoric—even a prehuman—inherited tendency. Because of this need we form groups for this purpose or that, natural communities, constantly changing and interchanging. Where these are of any size, and common action by all is required, or a subdivision of effort, an individual with greater experience or a more vivid imagination or better reasoning power (better technique in thought), or one whose whole being is so tuned that it acts as a flux for the others, takes charge for the time. Then, as purpose and community change, this process of natural selection sorts out the individuals afresh to their appropriate work. In this way versatility and adaptability as well as special powers develop, and the perfection of the individual and of the community go hand in hand.

Now consider a community in which energies are organized and standardized from above, as though building a pyramid from the top downwards, a school, for example, in which each individual is required to produce a predestined result by a certain age. It is quite possible that the effort needed may not be too great, and that the shape in which the result has to be presented may be in harmony with the individual's nerve-patterns and design of thought. It is equally possible that at one stage or another the demand on available energy may be too great, or the alteration required in individual thought-patterns be so drastic as to cause a permanent distortion of a natural product. In view of the standardized effort over a long period needed to pass an examination, it is probable that the nerve-technique of a large number of children is so canalized or crystallized as to be unable to adapt itself to the demands of adult life. A school organizing effort from above downwards is breaking a natural law. Where society as a whole is thus turned upside down the consequences are even more disastrous: the selection and training of the individual for the particular task is pushed farther and farther backward, and the power of choice begins to wither at an even earlier age, whilst free experiment along self-chosen lines is more and more restricted as childhood passes into adolescence.

When a brain is engaged upon some creative work, the solving of a problem, a piece of original composition, the making of a design in movement or thought or line, the exercise of a craft, even an oral answer to a question, its activities present a marvellous series of intricate actions and reactions. The nerve-cells which take in have received their messages, those which give out are waiting for the signal, those which choose are alive with energy. Memories of past experiences, half-forgotten thoughts, patterns of former efforts, new arrangements, pictures of pages read, earlier mistakes this time to be avoided, these and many others change and interchange like colours in a kaleidoscope, as the fresh task takes on its form and shape. In the technique of this choosing, rejecting this and accepting that, finding a better way of doing something old or a possible way of doing something new whether in movement or thought, lies the whole secret of that originality and adaptability on which progress depends. That we should spend years of life and growth in standardizing such effort, in training instead of education (whether in movement or thought), in replacing initiative by convention, can only be regarded as a major tragedy. Custom, tradition and ritual have their place in culture, but only as storehouses of past experience: when they crystallize the present they kill the future.

The narrow specialization which we try so hard to postpone, the restriction of activity and the gradual weakening of unused powers, or their repression and the discords which this produces, takes heavy toll of us in later life. The intricate nature of commerce and industry makes concentration on a single process more and more necessary. A term of years, or a whole working life, spent in doing the same sort of thing day after day with little opportunity for change, in which the material and the tools are the property of others, in which complete creation is never achieved, in which the real personal existence begins only after the office closes or the whistle blows, is obviously unnatural. Its ill effects might be perhaps avoided were co-operative ownership of the finished product possible: this would at least infuse into an often dreary task that living personal interest which is the life-blood of common effort.

The most damaging error of all is the division of our idea of the human being into mind and body. The immediate result is that body is less thought of than mind. As mind is considered to be worth more, body becomes worth less. Mind is more expensive than body because it has to be educated, whereas bodies are just born; they need not even be perfect in order to control a machine. Mind, too, loses caste when only limited and specialized demands are made upon it. We are suffering from an industrialization of movement and thought, a mass-production of parts instead of the growth of an individual whole. Not until we realize that the human being is indivisible shall we be able to set free the well-nigh limitless energy of John and Jane.